XCEL ENERGY
APPLICATION TO THE MINNESOTA ENVIRONMENTAL QUALITY BOARD FOR A ROUTE PERMIT

LAKEFIELD JUNCTION – FOX LAKE 161 KV TRANSMISSION LINE

ALTERNATIVE PERMITTING PROCESS
EQB DOCKET NO. 03-64-TR-XCEL

NOVEMBER 25, 2003

Xcel Energy
NORTHERN STATES POWER

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List of Acronyms and Abbreviations

BCE	before common era
BMP	best management practice
BPA	Bonneville Power Administration
CON	Certificate of Need
CWI	Minnesota County Well Index
CVT	Capacitive Voltage Transformer
dB	Decibels
dBA	A-weighted sound level recorded in units of decibels
d/b/a	doing business as
DNR	Minnesota Department of Natural Resources
EA	Environmental Assessment
EMF	electromagnetic field
EPA	United States Environmental Protection Agency
EQB	Minnesota Environmental Quality Board
G	Gauss
HVTL	high voltage transmission line
Hz	Hertz
JMU	Jackson Municipal Utilities
kV	Kilovolt
MDH	Minnesota Department of Health
mg/L	milligrams per liter – equivalent to parts per million (ppm)
MNDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MRES	Missouri River Energy Services
NAC	noise area classification
NESC	National Electrical Safety Code
NIEHS	National Institute of Environmental Health Sciences
NPDES	National Pollution Discharge Elimination System
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
PEBC	Prairie Ecology Bus Center
ppm	parts per million
PUC	Public Utilities Commission
PWI	Public Waters Inventory
ROW	Right-of-Way
SFD	Swan Flight Diverter
SHPO	State Historic Preservation Office
SNA	Scientific and Natural Area
TLE	Temporary Limited Easement
USDOE	United States Department of Energy
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WPA	Waterfowl Production Area
WMA	Wildlife Management Area

1.0 PROJECT SUMMARY

Northern States Power Company, d/b/a Xcel Energy (Xcel Energy), submits this application for a route permit from the Minnesota Environmental Quality Board (EQB) pursuant to Minnesota Rules Chapter 4400 and Minnesota Statutes Chapter 116C. The particular facility for which the permit is requested is a new 161 kV transmission line and the associated structures, electrical equipment and appurtenances to connect to the Lakefield Junction Substation in Jackson County, Minnesota and the Fox Lake Substation in Martin County, Minnesota (the Project). The need for this line has been established by the Public Utilities Commission (PUC or Commission) in its March 11, 2003 *Order Granting Certificates of Need Subject to Conditions* (PUC Docket No. E-002/CN-01-1958). Depending upon the final route, this line will be approximately 25.5 miles in length.

1.1 ELIGIBILITY FOR THE ALTERNATIVE PERMITTING PROCESS

The EQB rules provide for an Alternative Permitting Process for certain facilities. (Minnesota Rule 4400.2000, Subpart 1(A)-(G)). The Lakefield Junction – Fox Lake high voltage transmission line (HVTL) qualifies for the Alternative Permitting Process because it meets Minnesota Rule 4400.2000, Subpart 1(C), which authorizes the Alternative Permitting Process when the HVTL is between 100 and 200 kilovolts. The EQB submittal requirements are listed on Table 1.1 with cross-references indicating where information can be found in this application.

Table 1.1
Completeness Checklist

Authority	Required Information	Where
4400.1150, Subp. 2 Required per 4400.2100	**Site Permit for LEPGP** A. a statement of proposed ownership of the facility at the time of filing the application and after commercial operation	2.1
	B. the precise name of any person or organization to be initially named as permittee or permittees and the name of any other person to whom the permit may be transferred if transfer of the permit is contemplated	2.2
	C. at least two proposed routes for the proposed high voltage transmission line and identification of the applicant's preferred route and the reasons for the preference	Not applicable, per 4400.2100
	D. a description of the proposed high voltage transmission line and all associated facilities including the size and type of the high voltage transmission line	2.5, 3.2, 3.5
	E. the environmental information required under 4400.1150, Subp. 3	See 4400.1150, Subp. 3 (A)-(H) Below

Authority	Required Information	Where
	F. identification of land uses and environmental conditions along the proposed routes	4.1; 4.2.2
	G. the names of each owner whose property is within any of the proposed routes for the high voltage transmission line	5.2.3; Appendix J
	H. United States Geological Survey topographical maps or other maps acceptable to the chair showing the entire length of the high voltage transmission line on all proposed routes	Appendix C, Appendix D
	I. identification of existing utility and public rights-of-way along or parallel to the proposed routes that have the potential to share right-of-way with the proposed line	3.2.3
	J. the engineering and operational design concepts for the proposed high voltage transmission line, including information on the electric and magnetic fields of the transmission line	3.2; 3.6
	K. cost analysis of each route, including the costs of constructing, operating, and maintaining the high voltage transmission line that are dependent on design and route	2.7
	L. a description of possible design options to accommodate expansion of the high voltage transmission line in the future	3.2.2; Appendix D.6a-D.6c; Appendix F.1-F.3
	M. the procedures and practices proposed for the acquisition and restoration of the right-of-way, construction, and maintenance of the high voltage transmission line	3.3
	N. a listing and brief description of federal, state, and local permits that may be required for the proposed high voltage transmission line	5.3
	O. a copy of the Certificate of Need or the certified HVTL list containing the proposed high voltage transmission line or documentation that an application for a Certificate of Need has been submitted or is not required	Appendix B
4400.1150, Subp. 3	**Environmental Information** A. a description of the environmental setting for each site or route	4.1
	B. a description of the effects of construction and operation of the facility on human settlement, including, but not limited to, public health and safety, displacement, noise, aesthetics, socioeconomic impacts, cultural values, recreation, and public services	4.2
	C. a description of the effects of the facility on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining	4.3
	D. a description of the effects of the facility on archaeological and historic resources	4.4
	E. a description of the effects of the facility on the natural environment, including effects on air and water quality resources and flora and fauna	4.5

Authority	Required Information	Where
	F. a description of the effects of the facility on rare and unique natural resources	4.6
	G. identification of human and natural environmental effects that cannot be avoided if the facility is approved at a specific site or route	All of Section 4 in "Impacts"
	H. a description of measures that might be implemented to mitigate the potential human and environmental impacts identified in items A to G and the estimated costs of such mitigative measures	All of Section 4 in "Mitigative Measures"
4400.1350, Subp. 2 (Applicable to Alternative Permitting Process Per 4400.2300)	**Notice of Project** Subpart 2. Notification to persons on general list, to local officials, and to property owners	Will be submitted within 15 days of application submission
4400.2000, Subp. 1(C) and Subp. 2.	Subpart 1. **Eligible Projects**. An applicant for a site permit or a route permit for one of the following projects may elect to follow the procedures of parts 4400.2000 to 4400.2950 instead of the full permitting procedures in parts 4400.1025 to 4400.1900: high voltage transmission lines of between 100 and 200 kilovolts	1.1
	Subpart 2. **Notice to EQB**. An applicant for a permit for one of the qualifying projects in subpart 1, who intends to follow the procedures of parts 4400.2000 to 4400.2750, shall notify the EQB of such intent, in writing, at least ten days before submitting an application for the project	Appendix A
4400.2100	**Contents of Application** (alternative permitting process) The applicant shall include in the application the same information required in part 4400.1150, except the applicant need not propose any alternative sites or routes to the preferred site or route. If the applicant has rejected alternative sites or routes, the applicant shall include in the application the identity of the rejected sites or routes and an explanation of the reasons for rejecting them	3.4; See also 4400.1150, Subp.2 above
4400.3150	**Factors Considered** A. effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation, and public services	6.0 A
	B. effects on public health and safety	6.0 B
	C. effects on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining	6.0 C
	D. effects on archaeological and historic resources	6.0 D
	E. effects on the natural environment, including effects on air and water quality resources and flora and fauna	6.0 E
	F. effects on rare and unique natural resources	6.0 F

Authority	Required Information	Where
	G. application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity	6.0 G
	H. use or paralleling of existing rights-of-way, survey lines, natural division lines, and agricultural field boundaries	6.0 H
	I. use of existing large electric power generating plant sites	6.0 I (not applicable)
	J. use of existing transportation, pipeline, and electrical transmission systems or rights-of-way	6.0 J
	K. electrical system reliability	6.0 K
	L. costs of constructing, operating, and maintaining the facility which are dependent on design and route	6.0 L
	M. adverse human and natural environmental effects which cannot be avoided	6.0 M
	N. irreversible and irretrievable commitments of resources	6.0 N
4400.3350, Subps. 1 and 2	Subpart 1. **Wilderness areas**. No high voltage transmission line may be routed through state or national wilderness areas Subpart 2. **Parks and natural areas**. No high voltage transmission line may be routed through state or national parks or state scientific and natural areas unless the transmission line would not materially damage or impair the purpose for which the area was designated and no feasible and prudent alternative exists. Economic considerations alone do not justify use of these areas for a high voltage transmission line	Not Applicable
4400.3450	**Prohibited Sites**	Not Applicable
Minn. Stat. §116C.57, Subd. 4 (applicable per Minn. Stat. §116C.575, Subd. 8)	**Considerations in designating sites and routes** (1) Evaluation of research and investigations relating to the effects on land, water and air resources of large electric power generating plants and high voltage transmission lines and the effects of water and air discharges and electric and magnetic fields resulting from such facilities on public health and welfare, vegetation, animals, materials and aesthetic values, including base line studies, predictive modeling, and evaluation of new or improved methods for minimizing adverse impacts of water and air discharges and other matters pertaining to the effects of power plants on the water and air environment	3.6; 4.1-4.6; 6.0 A-C, E, F; Appendix E
	(2) Environmental evaluation of sites and routes proposed for future development and expansion and their relationship to the land, water, air and human resources of the state	3.2.2, 6.0 G
	(3) Evaluation of the effects of new electric power generation and transmission technologies and systems related to power plants designed to minimize adverse environmental effects	Not applicable
	(4) Evaluation of the potential for beneficial uses of waste energy from proposed large electric power generating plants	Not applicable
	(5) Analysis of the direct and indirect economic impact of proposed sites and routes including, but not limited to, productive agricultural land lost or impaired	All of Section 4 in "Impacts", 6.0 E

Authority	Required Information	Where
	(6) Evaluation of adverse direct and indirect environmental effects that cannot be avoided should the proposed site and route be accepted	All of Section 4 in "Impacts", 6.0 M
	(7) Evaluation of alternatives to the applicant's proposed site or route proposed pursuant to subdivisions 1 and 2	Not applicable to alternative process; see rejected routes discussion, 3.4
	(8) Evaluation of potential routes that would use or parallel existing railroad and highway rights-of way	3.2.3, 6.0 H
	(9) Evaluation of governmental survey lines and other natural division lines of agricultural land so as to minimize interference with agricultural operations	3.4.1; 4.3.1, 6.0 H
	(10) Evaluation of the future needs for additional high voltage transmission lines in the same general area as any proposed route, and the advisability of ordering the construction of structures capable of expansion in transmission capacity through multiple circuiting or design modifications	3.2.2, 3.4, 6.0 G
	(11) Evaluation of irreversible and irretrievable commitments of resources should the proposed site or route be approved	6.0 N
	(12) When appropriate, consideration of problems raised by other state and federal agencies and local entities	5.1; 5.2.1

1.2 NOTICE TO THE EQB

Xcel Energy notified the EQB by letter dated October 3, 2003 that the Company intended to utilize the Alternative Permitting Process for the proposed Lakefield Junction – Fox Lake HVTL Project. This complies with the requirement of Minnesota Rule 4400.2000 Subpart 2 to notify the EQB at least 10 days prior to submitting an application. A copy of this notice is attached in Appendix A.

2.0 INTRODUCTION

2.1 STATEMENT OF OWNERSHIP OF THE PROPOSAL

The Lakefield Junction – Fox Lake transmission line Project is a new, approximately 25.5 mile 161 kV transmission line. A portion of the line will include double circuit structures that would support a future 69 kV transmission line. The new 161 kV transmission line is part of a package of transmission lines Xcel Energy plans to build to support further wind development on the Buffalo Ridge. The Public Utilities Commission concluded that the line is needed and granted a Certificate of Need (CON) pursuant to Minnesota Statutes Section 216B.243 earlier this year. In the Matter of the Application of Northern States Power Company d/b/a Xcel Energy for Certificates of Four Large High Voltage Transmission Line Projects in Southwestern Minnesota, "Order Granting Certificates of Need Subject to Conditions," Docket No. E-002/CN-01-1958 (March 11, 2003 Order) (a copy of this order is included in Appendix B.)

Northern States Power Company, d/b/a Xcel Energy, will construct, own, operate and maintain the 161 kV transmission line. At the time of filing the application and after commercial operation, Alliant Energy will own the Lakefield Junction and Fox Lake Substations. Xcel Energy is permitting and paying for the transmission line and the substation improvements.

Ownership of the future 69 kV circuit on the double circuit structures between the Lakefield Junction Substation and the City of Jackson has not been determined at this time. Further detail on this issue is found in Section 3.2.2. It is Xcel Energy's understanding that the 69 kV line is not subject to the EQB's jurisdiction and consequently, is not part of this application.

2.2 PERMITTEE / PROJECT MANAGER

The permittee for the Project will be:

Permittee: Northern States Power Company
d/b/a Xcel Energy
414 Nicollet Mall
Minneapolis, Minnesota 55401

Contact: Pamela J. Rasmussen
Address: 1414 W. Hamilton Avenue
P.O. Box 8
Eau Claire, WI 54701
Phone: (715) 839-4661
Fax: 715) 839-2480
Email: pamela.jo.rasmussen@xcelenergy.com

Xcel Energy will be the sole permittee for the Project. Xcel Energy will pay for the facilities proposed in this application and manage the construction of all aspects of the project regardless of the ultimate ownership of the facilities after completion of construction. It is our intention to transfer the salient portion of the permit covering the expansion of the Alliant Energy Fox Lake Substation to Alliant Energy, in lieu of Alliant Energy applying for a minor alteration permit through a separate application.

2.3 CERTIFICATE OF NEED PROCESS SUMMARY

The transmission system in and around Buffalo Ridge currently has generator outlet capability of approximately 260 megawatts (MW) and is fully subscribed. More transmission capacity is needed to allow for increased wind generation in that region. On December 28, 2001, Xcel Energy filed an application with the PUC for CONs to construct four new HVTLs in southwestern Minnesota. In its application, Xcel Energy proposed several alternative transmission projects, each capable of improving the outlet capacity to approximately 825 MW. The proposal included a new 161 kV line from the Lakefield Junction Substation to the Fox Lake Substation. Construction of this line and associated improvements is expected to increase outlet capability on the Buffalo Ridge to 425 MW.

Public and technical hearings on the application were held in May, June and July of 2002 in Worthington, Pipestone, Redwood Falls and St. Paul. On March 11, 2003, the Commission found that Xcel Energy had demonstrated the need for transmission facilities to move 825 MW of wind generation from Buffalo Ridge and granted certificates of need for the Company to build four new lines:

- A new 161 kV transmission line connecting Lakefield Junction to Fox Lake (for which this routing application is made);
- A new 345 kV transmission line connecting Lakefield Junction to Split Rock in South Dakota;
- A new 115 kV transmission line connecting a new Nobles County Substation, located on the Lakefield Junction – Split Rock 345 kV line, with a new Fenton Substation and the existing Chanarambie Substation on Buffalo Ridge; and
- A new 115 kV transmission line connecting the Buffalo Ridge Substation with the White Substation in Lincoln County and South Dakota.

The new Lakefield Junction/Fox Lake 161 kV line is the first of the four lines that will be built pursuant to the Commission's March 11, 2003 Order.

2.4 PROJECT LOCATION

The Project will be located in Jackson and Martin Counties, Minnesota. (See Appendix C.1 and D.1). The following table provides the counties and sections in which the line will be located:

Table 2.1
Proposed Transmission Line Locations

County	Township Name	Township	Range	Sections
Jackson	Wisconsin	102	34	7-12, 17, 18
	Des Moines		35	13-18
	Hunter		36	3, 10, 13-15
Martin	Manyaska	102	32	5, 6
	Jay		33	1, 2, 7-12
	Fox Lake	103	32	32

2.5 PROJECT PROPOSAL

Xcel Energy proposes a new 161 kV transmission line connecting the Lakefield Junction and Fox Lake substations. The preferred route is shown on the maps in Appendix D.2 – D.5 and includes a new 161 kV transmission line along Interstate 90 (I-90) in Jackson and Martin Counties, Minnesota. The line will be located between the Alliant Energy Lakefield Junction Substation east of Lakefield, Minnesota and the Alliant Energy Fox Lake Substation near Sherburn, Minnesota. Approximately 10.9 miles of the 161 kV

transmission line will be constructed using double circuit structures to accommodate a future 69 kV circuit. A full description of the route is located in Section 3.1.

Minor modifications to the existing Lakefield Junction and Fox Lake Substations will be required to accommodate the new line and are discussed in more detail in Section 3.5.

2.6 PROJECT SCHEDULE

Xcel Energy proposes an in-service date of July 2006. A permitting and construction schedule summary is provided below:

Submit EQB Route Permit Application	November 25, 2003
EQB Review Process Complete	May 2004
Survey Permission and Survey	May 2004 – August 2004
Line and Substation Design	August 2004 – January 2005
ROW Acquisition	November 2004 – August 2005
Transmission Line and Substation Construction	August 2005 – July 2006
Final ROW Contacts, Damage Settlements and Cleanup	August 2006 – December 2006

2.7 PROJECT COSTS

The Project costs to Xcel Energy are estimated at **$11.3** million and a breakdown of the total Project costs is as follows:

Lakefield Junction – Fox Lake 161 kV Transmission Line	$10,279,063
Lakefield Junction Substation Modifications	$235,816
Fox Lake Substation Modifications	$760,042
Total Project Costs:	**$11,274,921**

Operating and maintenance costs for the transmission line will be nominal for several years since the line will be new and there is minimal vegetation maintenance required. Annual operating and maintenance costs for 161 kV transmission voltages across Xcel Energy's Upper Midwest system have averaged on the order of $500 per mile of transmission ROW of the last five years. The principal operating and maintenance cost will be inspections, usually done by airplane on a monthly basis and by helicopter with infrared equipment once a year.

3.0 ENGINEERING DESIGN, CONSTRUCTION AND RIGHT-OF-WAY ACQUISITION

3.1 ROUTE DESCRIPTION

The proposed route and detailed route maps are identified in Appendix D. Xcel Energy requests that the EQB grant a route permit for the Project as described below and shown on the route maps. Xcel Energy requests that a 25.5-mile route be approved that follows a 500-foot width from the centerline of the designated route to allow for reasonable flexibility in locating the transmission line. This area is identified in Appendix D.2 to D.5.

Lakefield Junction Substation to the Des Moines River

This nine-mile segment will use single pole double circuit structures that would accommodate a future 69 kV transmission line. The proposed route goes south from the Lakefield Junction Substation approximately two miles until it reaches the I-90 corridor. For this portion, Xcel Energy proposes that the line follow the existing Alliant Energy 161 kV and 345 kV line corridor. A corridor 500 feet wide from the designated route centerline is shown in Appendix D.2 to D.5. The existing Alliant Energy 161 kV line will be relocated to enter the Lakefield Junction Substation from the north. The new line will enter the substation from the south. The final design for the route out of the substation is dependent on several factors, including how the proposed Split Rock to Lakefield Junction 345 kV line will be routed and how the future 69 kV line will enter the Lakefield Junction Substation. The final configuration has not been determined and Xcel Energy requests flexibility in structure design and location for this reason. The final design of this area will be submitted to the EQB after the permit is issued, the site is surveyed and the line designed. Further discussion of this issue is included in Section 3.2.2. From the point where the new line meets I-90, it turns east and is located on the north side of I-90, traversing east and paralleling the highway corridor. Approximately 5.6 miles from where the line first joins with I-90, the line then crosses to the south side of Interstate 90, just west of the Minnesota Department of Transportation (MNDOT) I-90 rest stop near the Des Moines River. The line then crosses the Des Moines River. The section along I-90 is approximately seven miles long. The route is shown in more detail in Appendix D.2 to D.5.

Des Moines River through Jackson

This segment is approximately three miles long. After reaching the east side of the river, the line parallels I-90 for a short distance until it reaches an old railroad grade approximately 1800 feet from the edge of the riverbank. The line then follows the railroad grade south/southeast through the City of Jackson to Highway 51 for 1.7 miles. Single pole double circuit structures are proposed for this segment to accommodate a future 69 kV line. At the point where the line crosses Highway 51, Xcel Energy proposes to use single circuit structures. The line then follows a new route cross-country for 1.3 miles and turns north at the half section line of Section 18 in Wisconsin Township, Range 34, following a cross-country route for approximately 0.6 miles until it reaches I-90.

Jackson to the Fox Lake Substation

This route section is approximately 13.8 miles long. The transmission line parallels the south side of I-90 for approximately 9.7 miles and then crosses back over to the north side just west of 50th Avenue near Sherburn. (See Appendix D.5.) The line follows the north side of I-90 for approximately 2.9 miles until it reaches 70th Avenue in Sherburn. At this point, the line leaves I-90 and follows 125th Street for 0.9 miles until it reaches the Fox Lake Substation. Xcel Energy is proposing to build single pole double circuit 161 kV/161 kV structures in this area. Using double circuit structures for this short stretch will allow a reroute of the existing Alliant Energy Lakefield Junction – Fox Lake 161 kV transmission line in the future and reduce the number of poles in the area. The transmission line terminates at the Fox Lake Substation near 85th Avenue, south of Fox Lake. A detailed drawing of the proposed alignment of the line into the Fox Lake substation is found in Appendix D.7.

3.2 ENGINEERING AND OPERATIONAL DESIGN

3.2.1 TRANSMISSION STRUCTURES AND ROW DESIGN

3.2.1.1 Transmission Structure Design

Xcel Energy is proposing to use single pole, galvanized steel, davit arm structures for the Project. Figure 3.1 depicts the double circuit structures that will be used for the section of the line between the Lakefield Junction Substation and the Des Moines River and through part of Jackson and for the last section of the line entering the Fox Lake Substation. Figure 3.2 depicts the single circuit structures that will be used between Jackson and the Fox Lake Substation. The steel structures will allow for longer spans and to minimize maintenance costs.

The structures will be erected on concrete foundations. The single circuit structures will range from 70 to 110 feet tall, with an average height of 80 feet and an average span length between each structure of 600 feet. The double circuit structures will range from 75 to 115 feet tall, with an average height of 95 feet and have an average span length between each structure of 400 to 600 feet. H-frame structures were considered for the design of the structures, but were rejected because these structures would create increased land use impact along the Project corridor, which is predominately agricultural land. It is more difficult for farmers to maneuver machinery around a two-pole structure than a one-pole structure.

Figure 3.1: 161 kV/69 kV Double Circuit Structure

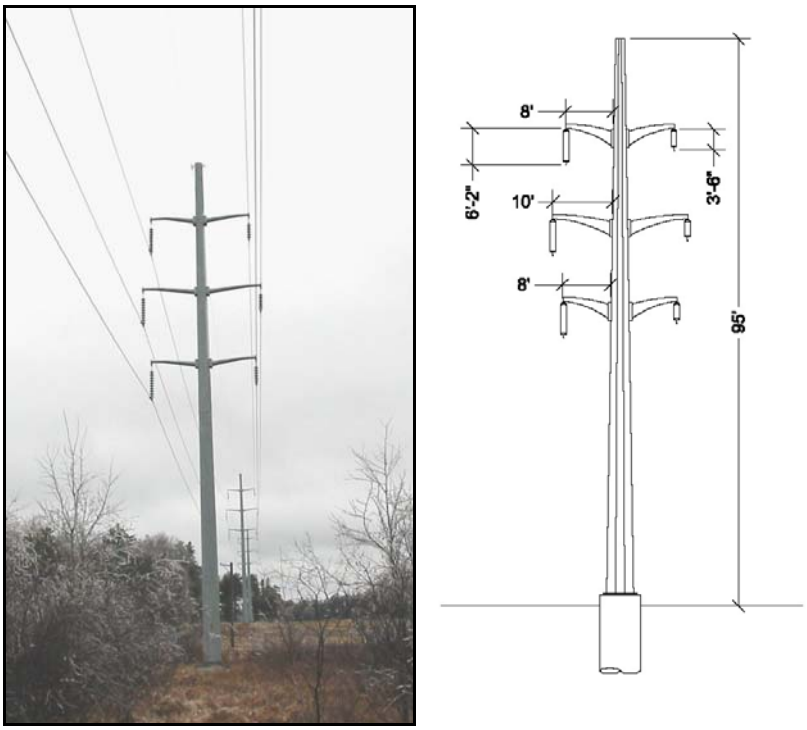
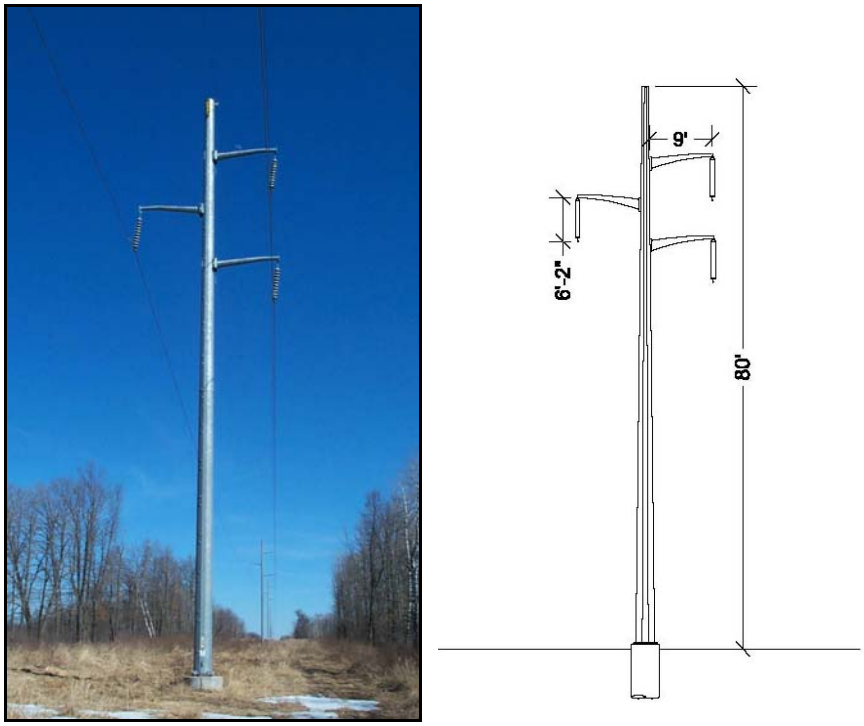


Figure 3.2: 161 kV Single Circuit Structure



Xcel Energy reviewed the crossing of the Des Moines River to determine if special structures were needed. It is expected that the Company can use the proposed double circuit structure type to span the crossing. The height of the structures will be between 100 to 125 feet.

The structures will be designed to accommodate 161 kV. The double circuit structures proposed between the Lakefield Junction Substation and Jackson will be designed to accommodate 161 kV for Xcel Energy's transmission line and 69 kV for the proposed transmission line. The double circuit structures proposed near Fox Lake will be designed to accommodate 161 kV on both sides, but only the Xcel Energy 161 kV line would be placed on the structure at this time. Figure 3.1 depicts this structure type, except that both sides would be designed to accommodate the 161 kV insulators. The proposed conductor for the transmission line is 795-kcmil 26/7 aluminum core steel supported (ACSS). The capacity of this conductor is 1620 amps. Average loading on the line in 2006 is expected to be 440 amps. For lightning protection, Xcel Energy will use 3/8-inch shield wire.

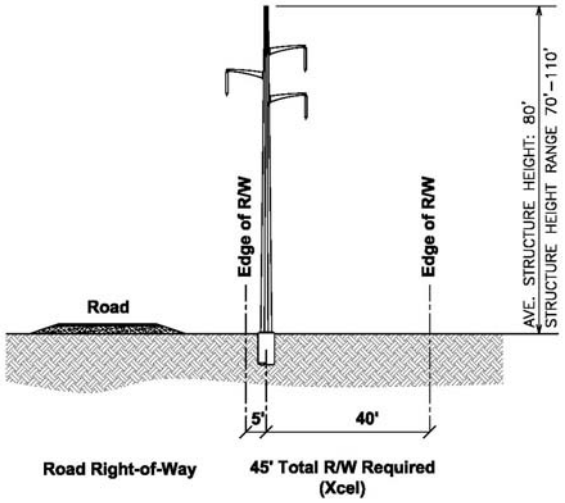
The proposed transmission line will be designed to meet or surpass all relevant state codes, the North American Electric Reliability Council (NERC) and Xcel Energy

Company standards. Appropriate standards will be met for construction and installation, and all applicable safety procedures will be followed during and after installation.

3.2.1.2 Right-of-Way

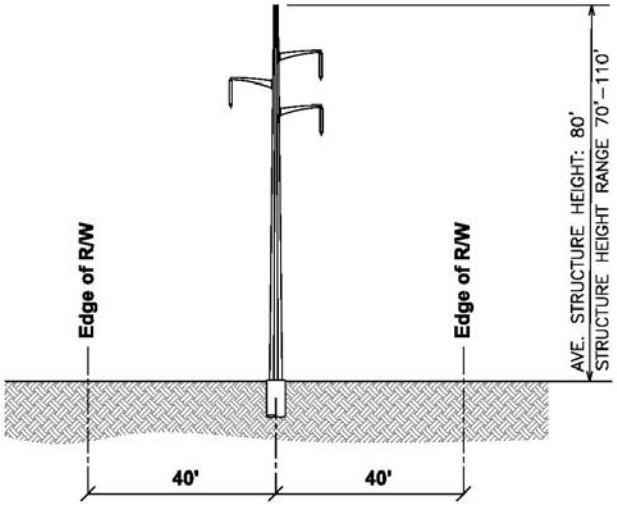
The majority of the proposed route will follow existing transmission line and road right-of-way (ROW). New ROW will be required along the two-mile corridor running south of the Lakefield Junction Substation to I-90, along the old railroad grade through the City of Jackson and along the spans going north to the Fox Lake Substation from I-90. Xcel Energy will require ROW throughout the Project corridor varying between 45 and 80 feet. Where the Project parallels a road, the required width will be 45 feet. (See Figure 3.3.) When the line is following a cross-country route, the ROW width will be 80 feet. (See Figure 3.4.) Table 3.1 provides a breakdown of the ROW requirements along the proposed route.

Figure 3.3: ROW When Paralleling Existing ROW



Xcel Energy 161 kV Davit Arm Structure
Right-of-Way Requirements
Adjacent to a Road

Figure 3.4: ROW When Route is Cross-Country



80' Total Right-of-Way (Xcel)

Xcel Energy 161 kV Davit Arm Structure Right-Of-Way Requirements

Table 3.1
Summary of Transmission Line Engineering Design Requirements

Description	Length (miles)	Structure Type	Average Structure Height (feet)	Average Span Length (feet)	ROW (feet)
Lakefield Junction Substation to the Des Moines River	9	Double circuit – single pole davit arm, steel	95	400-600	45 and 80
Des Moines River through Jackson	1.9	Double circuit – single pole davit arm, steel	95	400-600	45 and 80
	1.1	Single circuit – single pole davit arm, steel	80	600	80
Jackson to Fox Lake Substation	12.6	Single circuit – Single pole davit arm, steel	80	600	45 and 80
	0.9	Double circuit – Single pole davit arm, steel	95	400-600	45 and 80

3.2.2 DESIGN OPTIONS TO ACCOMMODATE FUTURE EXPANSION

As previously noted, Xcel Energy proposes to design a portion of the line to accommodate a 69 kV transmission line that has been proposed as part of the Southwest Minnesota Local Load Serving study that is in the final stages of completion. GRE is leading the study and plans to have the study completed by early 2004. The plan being evaluated proposes to have the 69 kV line and associated facilities in-service by December 2006 to meet local load serving requirements and reliability needs.

The new 69 kV line is needed because the electrical loads in the Jackson area will soon grow beyond the capability of the existing local transmission line system to reliably serve present day electric load. To maintain reliable service for the existing and future load, it is necessary to add two new sources to the Jackson area. The two new proposed sources consist of a 161/69kV substation on the north side of Jackson that would tap the 161 kV line and a new 69 kV circuit from the Lakefield Junction Substation that would be carried on the Project's double circuit structures. This proposal is still in the planning process, but it is expected to be pursued by the local utilities within the next few years. Xcel Energy believes it makes sense to build the new 161 kV transmission line capable of supporting the 69 kV circuit. This will minimize long-term landowner impacts. The Southwest Minnesota Local Load Serving planning team has studied several options for building the new circuit, including the option of tapping into the existing Alliant Energy line. The preliminary study results have shown the lowest cost alternative for building the new circuit would be to tap into the new 161 kV line. This option is $1 million dollars less expensive than tapping the existing Alliant Energy line. If the proposed double circuit section were approved by the EQB in this proceeding, either GRE or MRES would own the 69 kV line portion of the facility once constructed.

Routing at both substations will require some flexibility in the EQB approved location and structure type to accommodate future expansion and to minimize land use. The most complex planning will relate to the Lakefield Junction Substation. First, the existing Alliant Energy line will need to be moved to make room for the new 161 kV line. The Alliant Energy line currently leaves the substation from the south. It will be rerouted to the north side of the substation. (See Appendix D.6a.) The new 161 kV line will then exit the substation at the old Alliant Energy line location and head directly south along the existing HVTL corridor. Second, planning must consider the impacts of the new 345 kV Split Rock to Lakefield Junction transmission line and the future 69 kV line on this substation. It will be Xcel Energy's goal to work with Alliant Energy to develop a plan for the lines entering the Lakefield Junction Substation that minimizes design and safety conflicts at the substation and also minimizes land use impacts for the property around the substation. This will depend, in part, on the final route for the 345 kV line. Xcel Energy will be filing the route application for the Split Rock to Lakefield

Junction 345 kV transmission line in early 2004. The 345 kV line will connect into the Lakefield Junction Substation and terminate in Split Rock, South Dakota. Since Xcel Energy has not filed a route application for the 345 kV transmission line yet, it is unknown at this time precisely where the 345 kV line will enter the Lakefield Junction Substation. If it enters from the south, there may be an opportunity to use double circuit structures around the substation that would carry the 345 kV and the new 161 kV. The future 69 kV circuit would also connect at this substation. Depending on how the Southwest Minnesota Local Load Serving plans progress, there may also be an opportunity to utilize double circuit structures that could carry the 69 kV and the new 161 kV out of the substation. Xcel Energy has developed two preliminary route scenarios for this area and has included them as Appendix D.6b and D.6c. These are not the final proposed locations, but show some of the options available for entering the substation.

Xcel Energy believes the possibilities for accommodating expansion at this substation will narrow as this routing application process proceeds and firm up as construction progresses. At this time, the Company requests that the EQB authorize the rerouting of the Alliant Energy line to the north of the substation. Additionally, so that the most efficient plan can be implemented, the Company requests that the EQB authorize the new 161 kV to exit south of the substation on structure types to be approved later by the EQB. As discussed in Section 3.1, Xcel Energy would propose submitting final plans of the precise route and structure type to the EQB prior to beginning construction of the new 161 kV line near the substation.

At the Fox Lake Substation, the new 161 kV line will exit the substation from the south. Currently, the Alliant Energy line exits from the south as well. Xcel Energy is considering the possibility of double circuiting the new 161 kV line with the Alliant Energy line near the substation for a short distance, 0.9 miles, to minimize land use around the substation. The Company has determined that double circuiting for this limited span will not impact system reliability since the existing Alliant Energy line will stay energized during most of the construction in this area. The Company requests that the EQB authorize a route from the south of the substation at this time and rule on the structure type upon the Company's submission of final plans.

3.2.3 IDENTIFICATION OF EXISTING UTILITY AND PUBLIC RIGHTS-OF-WAY

The Project follows existing utility and public ROW for the majority of the route, except where indicated on Table 3.2.

Table 3.2
Summary of Utility, Public ROW & Other Corridor Sharing

Description	Length (miles)	Existing Transmission ROW (miles)	Highway ROW (miles)	Former Railroad ROW (miles)	New ROW (miles)
Lakefield Junction Substation to the Des Moines River	9	1.7	6.8	0	0.5
Des Moines River through Jackson to I-90	3	0	0	1.7	1.3
I-90 to Fox Lake Substation	13.5	0.9	12.3	0	0.3

3.3 RIGHT-OF-WAY ACQUISITION, CONSTRUCTION, RESTORATION AND MAINTENANCE PROCEDURES

3.3.1 RIGHT-OF-WAY ACQUISITION

After approvals to construct the Project are secured, Xcel Energy will initiate contact with landowners. (Xcel Energy has already held public meetings within the Project area to meet with potentially affected landowners and to describe the Project and permitting process. (See Section 5.2.) The Company will consult with the landowners to discuss the Project in detail prior to conducting any necessary surveys and soil investigations. As the design of the line is further developed, contacts with the owners of affected properties will continue and the negotiation and acquisition phase will begin for Xcel Energy to obtain the necessary land or easement rights for the facilities.

During the acquisition phase, individual property owners will be advised as to the construction schedules, needed access to the site and any vegetation clearing required for the Project. The ROW will be cleared of the amount of vegetation necessary to construct, operate and maintain the proposed transmission line. It is standard practice to remove any vegetation that at a mature height would be a danger to the line. Also, any vegetation that is in the way of construction equipment may have to be removed. Wood from the clearing operation will be offered to the landowner or removed from the site. Brush will be chipped and disposed of on the ROW.

Some structure locations may require soil analysis to assist with the design of the line. The Company will inform the landowners at the initial survey consultation that these borings may occur. An independent geotechnical testing company will take and analyze these borings.

Where possible, staging and lay down areas will be located within the ROW and limited to previously disturbed or developed areas. When additional property is temporarily required for construction, temporary limited easements (TLE) may be obtained from landowners for the duration of construction. TLEs will be limited to special construction access needs or additional staging or lay down areas required outside of the proposed transmission line ROW.

3.3.2 TRANSMISSION CONSTRUCTION PROCEDURES

Construction is planned to begin once required approvals are obtained and easement acquisition is completed. A detailed construction schedule will be developed based upon availability of crews, outage restrictions for lines that may be affected, weather conditions and any restrictions placed on certain areas for minimizing impacts from construction.

The proposed 161 kV transmission line will be constructed at-grade for the majority of the ROW. Generally, moderately sloping terrain conditions have minimal impact on site access by most construction equipment. Flat, level terrain conditions are preferred at, and immediately around, the structure foundation location. Grading is anticipated near the crossing of the Des Moines River, where it may be necessary to create a level area for construction access and activities at the pole sites.

Each steel pole structure will require a hole dug 15 to 20 feet deep and four to six feet in diameter. Any excess soil will be removed from the site unless otherwise requested by the landowner. The steel structures will be supported by a drilled concrete pier foundation. Structures located in poor or wet soil conditions may require a specially engineered foundation such as a steel caisson that would be vibrated into the ground.

Erosion control measures will be implemented to minimize runoff during construction. Specific measures will be determined once the final design of the route is complete and a field review is made to determine any areas of concern. Measures such as silt fencing, straw bale fencing, mulching, seeding or mesh fabric overlay would be installed when and where appropriate. Access routes to structure locations will be reviewed prior to the mobilization of equipment so erosion concerns can be avoided or minimized. Construction crews exercise caution when equipment is within fifty feet of streams and rivers and will not drive equipment through streams or rivers that the transmission line

crosses. At this time, given the flat terrain and reasonable access to the proposed route, there should be minimal need for erosion control measures.

Xcel Energy construction crews or an Xcel Energy contractor will comply with local, state, National Electric Safety Code (NESC) and Xcel Energy standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, ROW widths, erection of power poles and stringing of transmission line conductors.

Poles will be delivered to either the staked location or a Project storage yard. If the poles are delivered to the location where they will be installed, they will be placed on the ROW out of the clear zone of any adjacent roadways or designated pathways. Insulators and other hardware will be attached while the pole is on the ground. The pole will then be lifted, placed and secured on the foundation by a crane or similar heavy-duty equipment.

Once the structures have been erected, conductors will be installed by establishing stringing setup areas within the ROW. The stringing setup areas will usually be established every two miles along the Project route. Conductor stringing operations will also require brief access to each structure to secure the conductor wire to the insulators or to install shield wire clamps once final sag is established. Temporary guard or clearance poles will be installed as needed over existing distribution or communication lines, streets, roads, highways, railways or other obstructions after any necessary notifications are made and permits obtained. This ensures that conductors will not obstruct traffic or contact existing energized conductors or other cables.

3.3.3 RESTORATION PROCEDURES

During construction, crews will attempt to limit ground disturbance wherever possible. Upon completion of construction activities, landowners will be contacted to determine if any additional restoration due to construction is necessary. Disturbed areas will be restored to their original condition to the maximum extent practicable and as negotiated with the landowner. Post-construction reclamation activities include the removing and disposing of debris, dismantling all temporary facilities (including staging and lay down areas), leveling or filling tire ruts, employing appropriate erosion control measures and reseeding areas disturbed by construction activities with vegetation similar to that which was removed.

3.3.4 MAINTENANCE PROCEDURES

Xcel Energy will periodically use the ROW to perform inspections, maintain equipment and make repairs over the life of the line. Xcel Energy will also conduct regular routine maintenance approximately every five years to remove undesired vegetation that may interfere with the safe and reliable operation of the proposed transmission line.

3.4 DISCUSSION OF REJECTED ROUTE ALTERNATIVES

3.4.1 PARALLELING ALLIANT ENERGY 161 KV TRANSMISSION LINE

Xcel Energy also evaluated an alternative 24-mile route (the Alliant Energy Route) that would parallel an existing Alliant Energy 161 kV transmission line and connect the Lakefield Junction Substation to the Fox Lake Substation. In this rejected alternative, a new single pole 161 kV transmission line would have been constructed parallel to the existing Alliant Energy 161 kV transmission line, approximately one to two miles north of I-90. (See Appendix D.8.) The Alliant Energy Route would have exited the Lakefield Junction Substation and traversed east following the existing alignment of Alliant Energy's 161 kV line, primarily passing through agricultural fields, a drainage way, streams and the Des Moines River (approximately 6.4 miles).

After crossing the Des Moines River, the Alliant Energy Route would have continued east, primarily crossing agricultural fields, drainage ways and potential wetlands, until it aligned with I-90 east of State Highway 4. In the Jackson Municipal Airport restrictive zone, poles in this area would be limited to heights of 35-40 feet if the new runway being proposed for the Jackson Municipal Airport were approved. (Please see Section 4.2.9 for more information on the airport.) On the east side of the Des Moines River, the line would have been a single circuit facility for the remainder of the route until terminating at the Fox Lake Substation (approximately 16.1 miles).

This alternative was rejected for several reasons:

1) *Significant Agricultural Impacts:* Xcel Energy attempts to minimize impacts to agricultural lands by placing the line close to field breaks and fences, where possible, so that landowners will have minimal difficulty maneuvering around the poles. The rejected alternative would not have permitted the Company to do this. The wooden H-frame structures for the existing Alliant Energy transmission line are situated generally along the edge of fields within a 150-foot ROW. (Figure 3.5) To place the proposed 161 kV line adjacent to this line would have required that structures be placed in the farm fields. The new Xcel Energy line and the Alliant Energy line would need to be approximately 80 feet apart (Figure 3.6) to allow for adequate clearance between the lines requested by Alliant Energy and to allow for reasonable clearance for farm equipment to maneuver between the structures. Farmers in the area indicated that maneuvering around the poles would be difficult because some of the equipment typically used in the fields range from 30 to 90 feet in width, with larger equipment coming on the market. Additionally, this was the primary concern Xcel Energy heard expressed by landowners at the public meeting and by phone.

2) *Substantial Land Use Impacts:* The Alliant Energy Route was also rejected because it would not minimize land use impacts. There are plans to build a new 69 kV transmission line from Lakefield Junction to Jackson to address load-serving issues in the Jackson area. The plan includes construction of a new substation in the Jackson area, preferably in the commercial and industrial area just south of I-90. When considering the long-term electrical plans in the area, designing the line to accommodate a 69 kV line at a later date and placing the Project near the area where the 69 kV line would likely be built (I-90) reduces land use impacts.

Figure 3.5: Alliant Energy Wooden H-frame Structures

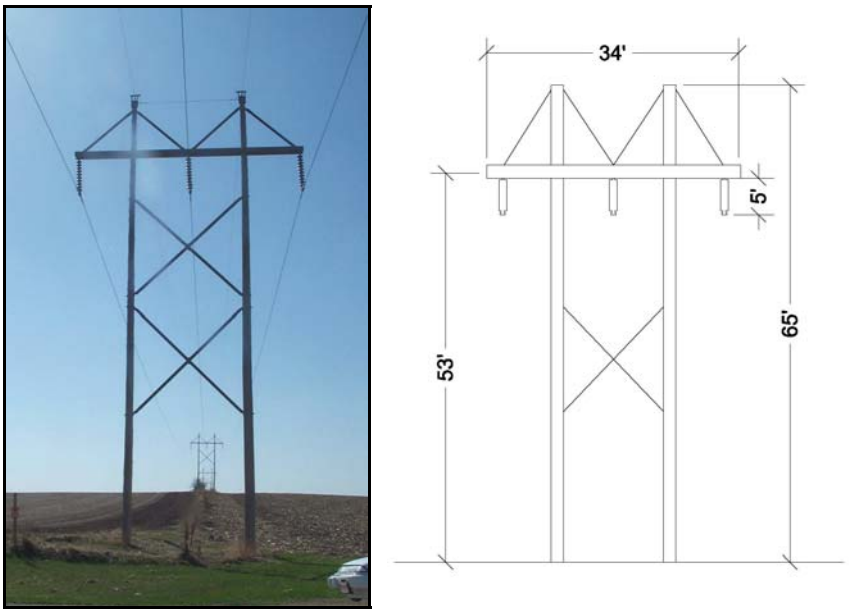
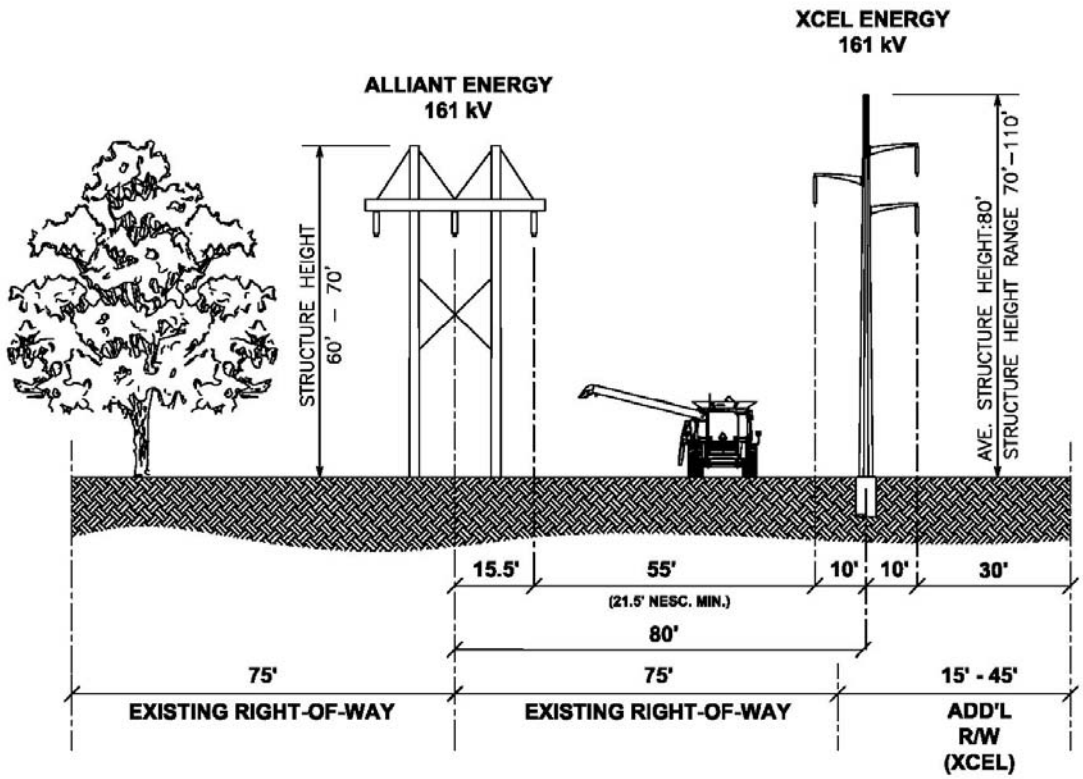


Figure 3.6: ROW when Route Parallels the Existing Alliant Energy 161 kV Line



Alliant Energy 161 kV Line and Xcel Energy 161 kV Davit-Arm Structure Right-of-Way Requirements

3) *Unavoidable Residential Impacts*: The Alliant Energy Route would also have caused unavoidable residential impacts. There are several homes in close proximity to the north side and south side of the existing Lakefield Junction – Fox Lake 161 kV transmission line. This would make it difficult to parallel the existing line without impacting the homes or designing the new line to cross the existing line in several locations. This would make the design and construction of the line difficult and costly. Moreover, two homes are situated less than 100 feet and five homes are less than 300 feet from the rejected route. If the rejected route were built north of the existing Alliant Energy line, two homes would have the new line directly adjacent to them. The same is true if the line were constructed south of the Alliant Energy line, which would have impacted different homes in a similar manner. The proposed route does not cause these significant residential impacts.

4) *Existing and Anticipated Airport Restrictions*: The Alliant Energy Route also was rejected because the planned expansion of the Jackson Airport would likely impose height restrictions on the existing Alliant Energy line as well as the proposed Xcel Energy 161 kV line. (See Section 4.2.9 for further discussion of the City of Jackson's airport expansion.) Current plans being considered for the airport would limit the pole heights to between 35 to 40 feet near the airport on the Alliant Energy corridor for several spans. This is not acceptable to Xcel Energy for the safe operation of the transmission line.

A comprehensive table of quantifiable impacts on resources along the rejected and proposed routes for the Project is provided in Appendix E.

3.4.2 REPLACING EXISTING ALLIANT ENERGY 161 KV TRANSMISSION LINE

It has been suggested by some landowners that instead of building a new line, the existing 161 kV Alliant Energy line should be torn down and replaced with a double circuit 161 kV line. This is not a viable option for consideration in this proceeding because the PUC already considered system configurations and determined that a <u>new</u> line was needed in the CON proceedings rather than rebuilding the existing Alliant Energy 161 kV transmission line. (See Minn. Rule 4400.3250 (once certificate of need granted; EQB is not to address "questions of need, including size, type, and timing, questions of alternative system configurations, and questions of voltage") *accord* Minn. R. 4400.2750, Subp. 7 (environmental assessment "shall not address questions of need, including size, type, and timing; questions of alternative system configurations; or questions of voltage"). Moreover, the owner of the subject line, Alliant Energy, is not a party to this proceeding and has no legal obligation to allow Xcel Energy to use its line

or change its configuration. As a result, Xcel Energy has not included double circuiting the existing line as an option for consideration.

Xcel Energy's CON application addressed several system configurations for the PUC's consideration and decision. It specifically raised the issue of double circuiting lines, noting that "reliability of the system is better served the more two circuits are separated." (Application, pp. 98-99.) The Company rejected the double circuit option for the Lakefield Junction – Fox Lake 161 kV line because it is an inferior electrical option due to reliability concerns:

> There are some elements to the transmission system that are so heavily relied upon that lengthy construction outages cannot be scheduled. In southwestern Minnesota one such example is the Lakefield Junction – Fox Lake 161 kV line. During many system's circumstances, while that line is out of service a single event could cause widespread power failures. Therefore, a new line *separate* from the existing circuit has been proposed.

(Application, p. 99 (emphasis added).)

During the CON hearings before an administrative law judge (ALJ), the propriety of and need for a new, separate line was further explored. The parties to the CON proceeding actively participated in developing the record on this issue. Based on the evidence presented, the ALJ recommended approval of the four CONs, including a separate and new line between Lakefield Junction and Fox Lake. In her order, the ALJ refused to accept arguments that the record on the possibility of upgrading the existing Alliant Energy line was not fully developed. The ALJ found that Xcel Energy adequately considered and correctly rejected the system configuration of upgrading the existing infrastructure between Lakefield Junction and Fox Lake: "Xcel did explain why upgrading the existing Alliant Energy line without a new transmission line was not feasible." (ALJ Report, p. 53.) Accordingly, the ALJ concluded that "Xcel has demonstrated the need for a <u>new</u> 161 kV line connecting Lakefield Junction Substation and Fox Lake Substation." (*Id.* at p. 46 (emphasis added).)

The Commission accepted this system configuration. In its Order dated March 11, 2003, the PUC authorized "a <u>new</u> 161-kV line in Jackson and Martin counties connecting the Lakefield Junction Substation and the Fox Lake Substation." (*Id.* at p. 23.) This decision is fully consistent with the rationale that physically separating the circuits necessarily makes the system more reliable. In appropriate circumstances, Xcel Energy does consider the potential of double circuiting lines with existing transmission lines if reliability is not compromised. Xcel Energy recognized that in this case upgrading the

existing line to improve the system was not an option because of the reliability concerns and therefore proposed a new line. The PUC accepted the evidence that showed that constructing a separate line is a better system alternative and effectively removed the Alliant Energy line route from routing consideration.

Because the PUC made the decision instructing the Company to build a separate and independent line, Xcel Energy has not included alternative system configurations in this routing application.

In addition, subsequent to the PUC's order requiring a separate line as part of the authorized system configuration, the Company has consulted with Alliant Energy on these issues. Significantly, Alliant Energy opposes the removal of its existing line. Alliant Energy also has stated that that reliability concerns preclude taking down the existing Alliant Energy line for any substantial period of time. Construction of the new 161 kV line will take approximately 10 months, which would leave no line in service during this period. Alliant Energy has advised Xcel Energy that an outage of 10 months would pose a significant risk to its customers and is therefore unacceptable. The double circuiting option may also limit flexibility. In evaluating the future needs for the area and likely expansion of the transmission system, double circuiting the existing line would be less desirable. (Minn. Stat. § 116C.57, Subd. 4 (10).) Xcel Energy understands that the Southwest Minnesota Local Load Serving study proposes the new 69 kV line from the Lakefield Junction Substation to Jackson to meet reliability and load serving needs to be in-service by December 2006. If the 161 kV line is built as a double circuit line along Xcel Energy's proposed route, the party that builds the 69 kV line will have the flexibility to coordinate its efforts with the new 161 kV line.

3.5 SUBSTATIONS

No new substations are proposed as part of the Project. However, modifications to the Lakefield Junction and Fox Lake substations will be required to support the new line. Xcel Energy will be paying for these changes as approved in the CON proceeding and requests that the EQB permit that work as part of this route application.

3.5.1 LAKEFIELD JUNCTION SUBSTATION

The Lakefield Junction Substation is located east of the city of Lakefield, in Section 3, Township 102N, Range 35W of Hunter Township. All modifications for this substation will occur within the existing fence.

Modifications to this substation will be required to accommodate the new 161 kV transmission line. Xcel Energy will pay for all of the changes at this substation necessary to accommodate this Project. The work at this substation will include relocating the

termination of the existing Alliant Energy Lakefield Junction – Fox Lake 161 kV line. The line currently exits the substation from the south and will be relocated to exit from the north. The new Lakefield Junction – Fox Lake 161 kV transmission line will then exit the substation from the south.

- An existing dead-end structure will be used to terminate the new line.
- A 161 kV, SF6 gas circuit breaker, its accompanying relaying and associated equipment will be installed to provide protection for line and substation equipment.
- System protection equipment, such as carrier relaying, a wave trap and a capacitive voltage transformer (CVT) will be added.

Minimal below-grade work inside the substation will be required to provide conduit-housed control and power cables to the breaker. The new breaker and bus-side switch will rest on existing foundations.

A drawing of the proposed changes is included as Appendix F.1 and F.2.

3.5.2 FOX LAKE SUBSTATION

The Fox Lake Substation is located northeast of Sherburn, Minnesota in Section 5, Township 102N, Range 32W of Manyaska Township. Modifications to this substation are required to accommodate the new 161 kV transmission line and Xcel Energy will pay for these changes. The work at this substation will include the following:

- An existing dead-end structure will be used to terminate the new line. The new transmission line will dead-end on the bay south of the termination of the existing transmission line.
- The new Lakefield Junction – Fox Lake 161 kV transmission line will be connected to an existing breaker. The existing breakers, relaying and associated equipment will protect the new line.
- The existing Lakefield Junction – Fox Lake 161 kV transmission line will be connected to a 161 kV, SF6 gas circuit breaker that will be installed at the substation. Its accompanying relaying and associated equipment will be installed to provide protection for line and substation equipment. System protection equipment, such as carrier relaying, a wave trap and a CVT will be added.

The addition of the breaker requires the western side of the substation to be extended 40 feet. The expansion also requires that a control equipment enclosure be built for relocation of control equipment from the Alliant Energy's Fox Lake generating plant and to provide adequate battery back up for the 161 kV switch station.

Grading will be required to allow for adequate drainage and site preparation. Foundations will be required for the switch stand, breaker, control equipment enclosure, bus support stands and fencing. The substation's ground grid will be enlarged to accommodate the substation's expansion. Other below grade work will be required for concrete cable trench, conduit and cable for the connection of substation equipment to the new control equipment enclosure.

Since the substation fence requires expansion, a minor alteration permit would normally be required from the EQB. Since the substation work is required for this Project and will be paid for by Xcel Energy, we request that the EQB approve the substation expansion as part of this proceeding.

Drawings of the proposed changes are included in Appendix F.3.

3.5.3 SUBSTATION PROPERTY ACQUISITION, CONSTRUCTION, RESTORATION AND MAINTENANCE PROCEDURES

No additional property will need to be acquired to accommodate the substation construction for this Project. All of the work required to install the new substation equipment for the 161 kV transmission line at the Lakefield Junction Substation will be contained within the existing fenced area. Minimal trenching work will be required to bury conduit to the existing underground cable. Gravel will be placed over the affected area.

The Fox Lake Substation site will need to be expanded in order to accommodate the new control house. The site expansion will be contained within Alliant Energy's existing property. Proper drainage and soil conservation measures will be performed in accordance with Alliant Energy standards and applicable environmental safeguards. Erosion control measures will be implemented to minimize runoff during construction. Gravel will be placed in the fenced areas and the unfenced areas impacted by construction will be seeded.

Minimal maintenance will be required for the substations. Periodic weed control will be done to inhibit plant growth in the substation.

3.6 ELECTRIC AND MAGNETIC FIELDS

The term EMF refers to electric and magnetic fields that are coupled together such as in high frequency radiating fields. For the lower frequencies associated with power lines, EMF should be separated into electric and magnetic fields. Electric and magnetic fields arise from the flow of electricity and the voltage of a line. The intensity of the electric field is related to the voltage of the line and the intensity of the magnetic field is related to the current flow through the conductors. Transmission lines operate at 60 hertz (cycles per second). This is the non-ionizing band of the electromagnetic spectrum.

3.6.1 ELECTRIC FIELDS

Voltage on any wire (conductor) produces an electric field in the area surrounding the wire. The electric field associated with a high voltage transmission line extends from the energized conductors to other nearby objects such as the ground, towers, vegetation, buildings and vehicles. The electric field from a power line gets weaker as one moves away from the line. Nearby trees and building material also greatly reduce the strength of power line electric fields.

The intensity of electric fields is associated with the voltage of the line and is measured in kilovolts per meter (kV/M). Power line electric fields near ground are designated by the difference in voltage between two points (usually one meter). Table 3.3 provides the electric fields at maximum conductor voltage for the proposed 161 kV transmission line. Maximum conductor voltage is defined as the nominal voltage plus five percent.

Table 3.3
Calculated Electric Fields (kV/m) for Proposed 161 kV Transmission Line Designs
(3 Feet Above Ground)

		Distance to Proposed Centerline								
Type	**Voltage**	**-300'**	**-200'**	**-100'**	**-50'**	**0'**	**50'**	**100'**	**200'**	**300'**
Single circuit davit arm	169 kV	0.01	0.02	0.11	0.42	0.83	0.49	0.14	0.03	0.01
Double circuit davit arm with 161/69 kV line	169/72 kV	0.01	0.02	0.03	0.18	0.90	0.04	0.03	0.01	0.01
Double circuit davit arm with 69 kV not installed	169/0 kV	0.01	0.02	0.04	0.18	1.03	0.04	0.03	0.02	0.01

The proposed 161 kV transmission line would have a maximum magnitude of electric field density of approximately 1.03 kV per meter underneath the conductors one meter

above ground level (this is a double circuit configuration without the 69 kV circuit installed). This is significantly less than the maximum limit of 8 kV per meter that has been a permit condition imposed by the Minnesota EQB in other HVTL applications. The Minnesota EQB standard was designed to prevent serious hazard from shocks when touching large objects, such as tractors, parked under extra high voltage transmission lines of 500 kV or greater.

3.6.2 MAGNETIC FIELDS

Current passing through any conductor, including a wire, produces a magnetic field in the area around the wire. The magnetic field associated with a high voltage transmission line surrounds the conductor and decreases rapidly with increasing distance from the conductor. The magnetic field is expressed in units of magnetic flux density, expressed as gauss (G).

The question of whether exposure to power-frequency (60 Hz) magnetic fields can cause biological responses or even health effects has been the subject of considerable research for the past three decades. There is presently no Minnesota statute or rule that pertains to magnetic field exposure. The most recent and exhaustive reviews of the health effects from power-frequency fields conclude that the evidence of health risk is weak. The National Institute of Environmental Health Sciences (NIEHS) issued its final report, "NIEHS Report on Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields" on June 15, 1999, following six years of intensive research. NIEHS concluded that there is little scientific evidence correlating EMF exposures with health risk.

The Minnesota State Interagency Working Group on EMF Issues, consisting of members from the Minnesota Department of Health, Department of Commerce, PUC, Pollution Control Agency and EQB conducted research related to EMF, which resulted in similar findings to the NIEHS report. The group issued "A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options" in September of 2002 wherein it stated:

> Research on the health effects of EMF has been carried out since the 1970s. Epidemiological studies have mixed results – some have shown no statistically significant association between exposure to EMF and health effects, and some have shown a weak association. More recently, laboratory studies have failed to show such an association, or to establish a biological mechanism for how magnetic fields may cause cancer.

The group concluded:

> *The Minnesota Department of Health (MDH) concludes that the current body of evidence is insufficient to establish a cause and effect relationship between EMF and adverse health effects*. However, as with many other environmental health issues, the possibility of health risk from EMF cannot be dismissed.

(Emphasis added.)

The conclusions of the Minnesota State Interagency Working Group are also consistent with those reached by the Minnesota Department of Health in 2000.

While the general consensus is that electric fields pose no risk to humans, the question of whether exposure to magnetic fields potentially can cause biological responses or even health effects continues to be the subject of research and debate. In addressing this issue, Xcel Energy provides information to the public, interested customers and employees for them to make an informed decision about EMF. Xcel Energy will provide measurements for landowners, customers and employees who request them. In addition, Xcel Energy has followed the "prudent avoidance" guidance suggested by most public agencies. This includes using structure designs that minimize magnetic field levels and siting facilities in locations with the fewest number of people living nearby.

Table 3.4 provides the existing and estimated magnetic fields based on the proposed line and structure design. The expected magnetic field for the proposed structure type and voltage has been calculated at various distances from the center of the pole in milligauss.

Table 3.4
Calculated Magnetic Flux Density (milligauss) for Proposed
161 kV Transmission Line Designs (3 feet Above Ground)

			Distance to Proposed Centerline								
	Condition	**Amps**	**-300'**	**-200'**	**-100'**	**-50'**	**0'**	**50'**	**100'**	**200'**	**300'**
Single pole davit arm, 161 kV line	Average	440	0.6	1.4	4.8	14	39	14	4.6	1.2	0.5
	Peak	660	0.8	1.8	6.6	21	58	22	7.4	2.1	1.0
Double circuit 161/69 kV davit arm with 161 and 69 kV lines installed	Average	440/68	0.6	1.2	4.8	14	28	9	3.3	1.0	0.5
	Peak	660/125	0.8	1.9	7.2	21	42	13	4.9	1.5	0.7
Double circuit 161/69 kV davit arm without 69 kV line installed	Average	440/0	0.6	1.3	5.1	15	29	10	3.7	1.1	0.5
	Peak	660/0	0.9	2.0	7.6	23	44	14	5.5	1.6	0.8

3.6.3 STRAY VOLTAGE

Stray voltage is defined as a natural phenomenon that can be found at low levels between two contact points in any animal confinement area where electricity is grounded. Electrical systems, including farm systems and utility distribution systems, must be grounded to the earth by code to ensure continuous safety and reliability. Inevitably, some current flows through the earth at each point where the electrical system is grounded and a small voltage develops. This voltage is called neutral-to-earth voltage (NEV). When a portion of this NEV is measured between two objects that may be simultaneously contacted by an animal, it is frequently called stray voltage. Stray voltage is not electrocution, ground currents, EMFs or earth currents.

Stray voltage has been raised as a concern on some dairy farms because it can impact operations and milk production. Problems are usually related to the distribution and service lines directly serving the farm or the wiring on a farm affecting farm animals that are confined in areas of electrical use. In those instances when transmission lines have been shown to contribute to stray voltage, the electric distribution system directly serving the farm or the wiring on a farm was directly under and parallel to the transmission line. These circumstances are considered in installing transmission lines and can be readily mitigated. The new 161 kV transmission line is not proposed to run parallel to any existing distribution line for long distances. Therefore, no stray voltage issues are anticipated with this Project.

4.0 ENVIRONMENTAL INFORMATION

This section provides a description of the environmental setting, potential impacts and mitigative measures Xcel Energy has proposed, where necessary, to minimize the impacts of siting, constructing and operating the proposed Project. The rules require an applicant to provide cost estimates for the various mitigative measures proposed to address impacts. The majority of the measures proposed are part of the standard construction process at Xcel Energy. Unless otherwise identified in the following text, the costs of the mitigative measures proposed are considered nominal.

4.1 DESCRIPTION OF ENVIRONMENTAL SETTING

Jackson and Martin Counties lie in the Prairie Grassland region of southwestern Minnesota. This area was covered by glacial ice over 15,000 years ago. The landscape resulting from the glaciation is characterized by gently rolling hills, shallow prairie lakes and wetlands. The topography in the Project area is relatively level to sloping land with elevations ranging from 1270 to 1560 feet. The corridor crosses the Des Moines River at Jackson and the East Fork of the Des Moines River just east of the Jackson/Martin County line.

There are distinct physiographic areas within the Prairie Grassland region. The western end of the Project corridor lies in the Coteau Moraines subsection of the Prairie Grasslands while the eastern portion is in the Minnesota River Prairie subsection. The Coteau des Prairies (also referred to as Buffalo Ridge) is a plateau in eastern South Dakota and southwestern Minnesota. The Coteau Moraine area is a belt of high, hilly terrain on the eastern flank of the plateau. The Minnesota River Prairie subsection is an area of large glacial till plains with gently rolling ground moraines.

Pre-settlement vegetation was tall grass prairie. The primary present-day land use is agriculture and little native prairie is left. Many of the small lakes and wetlands were drained for agricultural purposes.

Lakefield lies west of the corridor's western end. The proposed route corridor passes north of Jackson and Alpha and terminates north of Sherburn. The majority of the corridor passes through pasture and cropland that includes corn and soybeans. Residential land use along the Project corridor is primarily farmsteads surrounded by agricultural land. Concentrations of trees surround some of the farmsteads along I-90 and sporadic pockets of forest are also present.

The primary tree cover within the Project area occurs near the Des Moines River and consists of oak, ash, willow and elm trees. Maps identifying the Project area and land uses are located in Appendix D.9.

4.2 HUMAN SETTLEMENT

4.2.1 PUBLIC HEALTH AND SAFETY

Proper safeguards will be implemented for construction and operation of the facility. The Project will be designed with the local, state, NESC and Xcel Energy standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, strength of materials and ROW widths. Xcel Energy construction crews and/or contract crews will comply with local, state, NESC and Xcel Energy standards regarding installation of facilities and standard construction practices. Established Xcel Energy and industry safety procedures will be followed during and after installation of the transmission line. This will include clear signage during all construction activities.

The proposed transmission line will be equipped with protective devices to safeguard the public from the transmission line if an accident occurs and a structure or conductor falls to the ground. The protective devices are breakers and relays located where the line connects to the substation. The protective equipment will de-energize the line should such an event occur. In addition, the substation facility will be fenced and access limited to authorized personnel. The costs associated with these measures have not been tabulated separately from the overall Project costs since these measures are standard practice for Xcel Energy.

4.2.1.1 Mitigative Measures

There are no mitigative measures necessary to address human health and safety.

4.2.2 COMMERCIAL, INDUSTRIAL, RESIDENTIAL LAND USE

The transmission line primarily crosses through areas zoned agriculture. The Martin County zoning map shows that the lands that the transmission line crosses are zoned "Agricultural." However, Fox Lake itself is zoned "Residential Recreation District" (SL2). The zoning ordinance describes this district as an area " . . . for shoreland areas that are appropriate in serving to meet the demand for a reasonable amount of freestanding rural residential development." The transmission line will pass through this district as it enters the Fox Lake Substation. (Appendix H.1).

Jackson County's zoning map indicates that the areas the transmission line will cross are zoned "Agriculture." The line will also border property zoned "Urban/Rural" and will cross the Des Moines River which is zoned "Shoreland Natural Environment." The

Jackson County Development Code describes the "Urban/Rural" districts as areas that "provide areas within the County where urban development can take place and where urban services can be readily extended and provided." The purpose of the "Shoreland Natural Environment" district is to ". . . control the use of any shoreland of public waters . . ." within Jackson County.

There are two municipalities that the transmission line will cross, Sherburn and Jackson. In Sherburn, the transmission line will cross an area zoned "Business." The lands that the transmission line will cross in the City of Jackson are zoned "Service Business District" and "General Industrial District."

Commercial land use near the Project corridor is primarily related to businesses that cater to travelers along the I-90 corridor. These businesses provide services such as lodging, restaurants and gasoline. There are eight businesses within 300 feet of the proposed ROW, most of which are in the City of Jackson General Industrial District and Service Business District and Jackson County's General Industrial District on the south side of I-90. The north side of the Interstate is zoned General Industrial, with three businesses present. All of the businesses in this area are primarily service-related (i.e. gasoline, lodging, food, etc.), but also include industrial operations. The south side of I-90 in Jackson is dominated by commercial and industrial uses. The largest company is Ag-Chem, a division of AGCO, which employs more than 900 people. It is located on the frontage road adjacent to I-90 in Jackson. Ag-Chem is the nation's largest agricultural sprayer manufacturer.

4.2.2.1 General Impacts

In determining the route for the transmission line, the primary area where land use impacts for commercial and industrial use arose was in the City of Jackson. The Jackson Airport, Ag-Chem and the City of Jackson's plans for expansion and development in this area played a role in the final route proposal. Further discussion of the Jackson Airport is found in Section 4.2.9.

Ag-Chem identified the potential for impacts to industrial land use near the Project corridor due in part to its announced plans to expand its agricultural equipment-related operations in Jackson. The company has expressed concerns about the transmission line being routed along the south side of I-90, as it may hinder these expansion plans. Xcel Energy considered these comments during the route selection process, which included information on how a route along an abandoned railroad corridor would minimize impacts to Ag-Chem's expansion plans. (See Appendix G.11.)

There are 10 homes within 300 feet of the proposed ROW. There are no homes within 100 feet. A more complete description of the distances of residences to the proposed transmission line is in Appendix E.1.

Xcel Energy located the route along I-90 to reduce the impacts to residential and farming operations. Between 300 to 500 feet west of 50th Street, there are two homes that are adjacent to the I-90, but across the highway from each other. (See Appendix D.5.) Xcel Energy plans to site the line to minimize tree clearing near those homes by moving the transmission line from one side of I-90 to the other to avoid coming close to the houses.

Any existing windbreaks located in the ROW will remain, provided the trees do not or will not present a risk of contacting the energized conductor.

4.2.2.2 Mitigative Measures

Xcel Energy will work with Martin and Jackson counties to ensure that all the requirements for construction within zoning districts are met.

The route through Jackson minimizes impacts to commercial and industrial uses in that area by following an existing corridor.

4.2.3 DISPLACEMENT

Displacement of a business or home would occur only if the final location of the transmission line would be too close where NESC requirements could not be met. The NESC identifies minimum vertical and horizontal clearances from a conductor to a building or structure. In most cases, the transmission structure can be located or configured to accommodate NESC minimum clearances to the building. In some situations, minor changes in the line route can avoid a particular building or structure. There is no building along the route of this Project that would require relocation due to the new transmission line.

4.2.3.1 Potential Impacts

The HVTL route is planned to minimize impacts on residents and businesses. Displacement of residential homes or businesses is not anticipated.

4.2.3.2 Mitigative Measures

Since no relocations will occur, no mitigative measures are required.

4.2.4 NOISE

4.2.4.1 Potential Impacts

Noise is comprised of a variety of sounds of different intensities, across the entire frequency spectrum. Humans perceive sound when sound pressure waves encounter the auditory components in the ear. These components convert these pressure waves into perceivable sound. Transmission conductors and transformers at substations produce noise under certain conditions. The level of noise or its loudness depends on conductor conditions, voltage level and weather conditions. Noise emission from a transmission line occurs during heavy rain and wet conductor conditions. In foggy, damp, or rainy weather conditions, power lines can create a subtle crackling sound due to the small amount of the electricity ionizing the moist air near the wires. During heavy rain the general background noise level is usually greater than the noise from a transmission line. In addition, very few people are out near the transmission line. For these reasons audible noise is not noticeable during heavy rain. During light rain, dense fog, snow and other times when there is moisture in the air, the proposed transmission lines will produce audible noise higher than rural background levels but similar to household background levels. During dry weather, audible noise from transmission lines is an imperceptible, sporadic crackling sound.

Noise is measured in units of decibels (dB) on a logarithmic scale. Because human hearing is not equally sensitive to all frequencies of sound, certain frequencies are given more "weight." The A-weighted (dBA) scale corresponds to the sensitivity range for human hearing. Noise levels capable of being heard by humans are measured in dBA, the A-weighted sound level recorded in units of decibels. A noise level change of 3-dBA is imperceptible to human hearing. A 5-dBA change in noise level, however, is clearly noticeable. A 10-dBA change in noise levels is perceived as a doubling of noise loudness, while a 20-dBA change is considered a dramatic change in loudness. Table 4.1 shows noise levels associated with common, everyday sources, and places the magnitude of noise levels discussed here in context.

Table 4.1
Common Noise Sources and Levels

Sound Pressure Level (dB)	Typical Sources
120	Jet aircraft takeoff at 100 feet
110	Same aircraft at 400 feet
90	Motorcycle at 25 feet
80	Garbage disposal
70	City street corner
60	Conversational speech
50	Typical office
40	Living room (without TV)
30	Quiet bedroom at night

Source: Environmental Impact Analysis Handbook, ed. by Rau and Wooten, 1980

Minnesota Rule 7030.0040 establishes standards to regulate noise levels by land use types. Land uses such as picnic areas, churches or commercial land are assigned to an activity category based on the type of activities occurring in each respective land use. Activity categories are then sorted based on their sensitivity to traffic noise. The Noise Area Classification (NAC) is listed in the Minnesota Pollution Control Agency (MPCA) noise regulations (Minnesota Rule 7030.0050) to define the categories. The table below identifies the established noise standards for daytime and nighttime grouped by NAC.

Table 4.2
Noise Standards by Noise Area Classification

Noise Area Classification	Daytime		Nighttime	
	L_{50}	L_{10}	L_{50}	L_{10}
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

Residences are the nearest receptors to the substations and would fall under NAC 1. The nearest receptor to the Fox Lake Substation is approximately 500 feet, whereas the nearest receptor to the Lakefield Junction Substation is 1300 feet. No new transformers or other equipment will be installed at the substations that would increase the noise level. In addition, the Fox Lake power plant is located adjacent to the Fox Lake Substation and produces greater noise levels than the substation.

Table 4.3
Noise Calculations (dBA) at Edge of ROW

Type	Line	L_5 (rain)	L_{50} (rain)	Assumed ROW Width
Double circuit 161/69 kV structure	Assume 69 kV line not energized	43	30	80
Double circuit 161/69 kV structure	Assume 69 kV energized	43	30	80
Single circuit 161 kV davit arm structure		39	24	80

Another source of noise associated with transmission lines is corona. Corona on transmission line conductors can generate electromagnetic noise that can cause interference with radio waves depending on the frequency and strength of a radio and television signal.

4.2.4.2 Mitigative Measures

No mitigative measures are necessary since there will be nominal corona or noise impacts from the Project. If radio or television interference occurs because of the power line, Xcel Energy will work with the affected landowner to mitigate the problems so that reception is restored.

4.2.5 AESTHETICS

4.2.5.1 Potential Impacts

The proposed transmission line will be single steel poles spaced approximately 600 feet apart and 80 to 95 feet high. The transmission line will be visible along I-90 throughout all portions of the corridor. It will be a contrast to the open agricultural areas and will be visible for a short distance to boaters on the Des Moines River. No significant additional impacts to the visual character of the Des Moines River will occur because Xcel Energy plans to cross at a location where the viewscape is already altered by the Interstate.

The line will be visible from Fort Belmont, a replica of an 1860 fort. Further discussion of Fort Belmont is found in Section 4.3.3.

4.2.5.2 Mitigative Measures

Although the transmission line will contrast with the surrounding land uses, these areas have already been impacted visually by the construction of the Interstate, the existing

transmission lines and the development in Jackson. At the crossing of the Des Moines River, Xcel Energy has investigated measures to minimize the visual impacts caused by the new 161 kV line. Specifically, Xcel Energy evaluated structure designs that will have a longer span without adding a considerable amount of height to the poles. Section 3.2.1.1 discusses this design option in more detail. It is expected that the proposed structure design can be used to cross the river.

The route along the abandoned railroad corridor through Jackson was chosen based upon additional field review and the suggestions and input of several parties. In addition, the route should minimize impacts on development in the area since it follows a existing corridor for most of its length.

4.2.6 SOCIOECONOMIC

According to the 2000 U.S. Census, Jackson is the largest city along the Project corridor followed by Lakefield, Sherburn and Alpha (Table 4.4). Population in the region is relatively unchanged from the 1990 Census.

Table 4.4
Population and Economic Characteristics

Location	Population	Per Capita Income	Percentage of Population Below Poverty Level
Jackson County	**11,268**	**$17,499**	**8.6**
City of Alpha	126	$18,769	2.4
City of Jackson	3,501	$18,444	11.1
City of Lakefield	1,721	$16,003	9.0
Martin County	**21,802**	**$18,529**	**10.5**
City of Sherburn	1,082	$15,079	10.6

Source: 2000 U.S. Census: General Demographic Characteristics

According to the 2000 Census race demographics, Jackson County is 97.1% white and Martin County is 97.2% white. Minority groups in the area constitute a very small percentage of the total population. This trend is consistent throughout the cities in the Project area.

Less than 12% of all individuals in the two counties and four cities of the Project corridor are considered below poverty level (Table 4.4). The City of Jackson has the highest percentage of population below the poverty level (11.1%) and the City of Alpha has the lowest (2.4%).

Historically, the economies of Jackson and Martin Counties have been based in agricultural production. In recent decades area cities such as Jackson have worked to

attract new businesses. The Jackson Municipal Airport may be expanded as part of this effort. According to the 2000 U.S. Census, the major industries in both Jackson and Martin County are manufacturing, agriculture, retail and education/social services. A number of the manufacturing operations have an agricultural connection.

4.2.6.1 Potential Impacts

Short-term impacts to socioeconomic resources will be relatively minor. The construction, operation and maintenance of the transmission line will not have a significant effect on agricultural operations. Xcel Energy has calculated that approximately 67.13 acres of agricultural land will be temporarily impacted by the Project and 0.21 acres will be permanently taken from production. Project construction will not cause additional permanent impacts to leading industries within the Project area.

The relatively short-term nature of the Project construction and the number of workers who will be hired from outside of the Project area should result in short-term positive economic impacts in the form of increased spending on lodging, meals and other consumer goods and services. It is not anticipated that the Project will create new permanent jobs, but it will create temporary construction jobs that will provide a one-time influx of income to the area. Xcel Energy anticipates the following number of people will be working on this Project:

Table 4.5
Estimated Numbers of Workers for Construction

Type of Work	Number of Employees	Comments
Right-of-Way	1	
Survey	2	
Construction – Foundations	6-8	
Construction – Poles	12-15	
Construction – Substation	4	
Office Personnel	4	Infrequent Visits

There will also be some long-term beneficial impacts from the new lines. These benefits include an increase to the counties' tax base resulting from the incremental increase in revenues from utility property taxes based on the value of the Project. The availability of reliable power in the area will have a positive effect on local businesses and the quality of service provided to the general public. This transmission line will improve the capability of local wind generators to transport energy generated in the region. This in turn may increase the amount of wind development in the area and will contribute to the local economy through easement dollars and taxes generated due to wind farm construction and operation. The establishment of this area of Minnesota as an important producer of

alternative energy sources, primarily wind, may also spur the development of wind-related businesses in the area, in turn contributing to economic growth in the region.

The development of wind energy in this region has been important in diversifying and strengthening the economic base of southwestern Minnesota. Northwest Economic Associates prepared a report, "Assessing the Economic Development Impacts of Wind Power," that includes a case study of the Lake Benton I wind project in Lincoln County, Minnesota. The study stated that the Lake Benton I development in Lincoln County generated a total of eight jobs (direct, indirect and induced) and $98,000 in personal income from the construction phase, and a total of 31 jobs and $909,000 annually from the operation and maintenance phase. The Lake Benton I wind facility is designed for 20 years of operation. The major sectors affected by the Lake Benton I wind development are the trade and service sectors. In addition to the creation of jobs and personal income, the development generated $611,200 in county property taxes in 2000, representing thirteen percent of the property taxes collected in Lincoln County.

The Minnesota Wind Project stated that each 100 MW of new wind development in southwest Minnesota could be expected to generate about $250,000 per year in direct lease payments to landowners. Property taxes on wind facilities are changing as a result of tax changes enacted in 2002 by the State legislature. For example, a 100 MW wind facility will generate approximately $370,000 in tax revenue for the entire life of the project.

If local contractors are used for portions of the construction, total wages and salaries paid to contractors and workers in Jackson and Martin Counties will contribute to the total personal income of the region. Additional personal income will be generated for residents in both counties and the state by circulation and recirculation of dollars paid out by the applicant as business expenditures and state and local taxes.

Expenditures made for equipment, energy, fuel, operating supplies and other products and services benefit businesses in the counties and the state. Indirect impact may occur through the increased capability of the electric system to supply energy to commercial and industrial users, which will contribute to the economic growth of the region.

4.2.6.2 Mitigative Measures

Socioeconomic impacts resulting from the Project will be primarily positive with an influx of wages and expenditures made at local businesses during the Project construction and increased tax revenue. Mitigative measures are not necessary.

4.2.7 CULTURAL VALUES

Cultural values include those perceived community beliefs or attitudes in a given area, which provide a framework for each social group's unity. The communities along the Project corridor value their pioneer roots, the history of their settlement and their predominately agricultural economy.

4.2.7.1 Potential Impacts

No impacts are anticipated to the communities' cultural values within the Project corridor.

4.2.7.2 Mitigative Measures

No impacts are anticipated; therefore, no mitigative measures are required.

4.2.8 RECREATION

Recreational opportunities in the region of the Project corridor include cross-country skiing, snowmobiling, hiking, canoeing, boating, fishing, camping, equestrian riding, swimming, hunting and nature observation. Appendix D.11 shows the locations of recreation and wildlife areas within the proposed Project vicinity. There are no Scientific and Natural Areas (SNA) within the immediate vicinity of the Project corridor. Within the Project vicinity, there are five Wildlife Management Areas (WMAs). Only one of these areas is within the Project corridor.

The Des Moines River is a State Canoe Route. There are two public carry-in river access points in Jackson. The Des Moines Valley Sportsman Club lies just south of the Project corridor along the Des Moines River in Jackson. The club offers a rifle and archery range. The Jackson Golf Club lies just south of the Project corridor on Highway 71. The Fox Lake State Game Refuge (FLSGR) encompasses Fox and Temperance Lakes. The refuge is part of the DNR's wildlife management operations and offers opportunities for wildlife observation. The DNR may allow hunting at the refuge under certain conditions. The Fox Lake WMA is also located at this site. The DNR manages a public boat trailer access area on Temperance Lake, which is within the Project corridor.

4.2.8.1 Potential Impacts

No direct impacts to area recreation are anticipated; however, the proposed transmission line may be visible in the areas of Clear Lake and Fox Lake, and will cross the Des Moines River State Canoe Route next to I-90. The proposed line will also pass next to the Jackson Golf Club.

4.2.8.2 Mitigative Measures

Xcel Energy will design the line near the golf course to minimize the need to clear any trees adjacent to the course. Additionally, significant impacts to the visual character of the Des Moines River will be avoided since the transmission line will cross the river adjacent to I-90, which has already altered the viewscape. The proposed structures are described in 3.2.1.1, and will be placed in the upland areas to permit the transmission line to span the river. I-90 will separate the transmission line from Clear Lake. Although Fox Lake is near the proposed Project, the incremental impact of the line is nominal given the nearby power plant and existing transmission lines.

4.2.9 PUBLIC SERVICES

There are four cities within the vicinity of the proposed transmission line: Lakefield, Jackson, Alpha and Sherburn.

The City of Jackson is the largest city of the four and has the most public service agencies. Both the Jackson Municipal Airport and Jackson Medical Center Hospital serve the area. Jackson has a police department, fire and ambulance department and a sheriff's department. There is also a sheriff's reserve department unit that consists of volunteers. Jackson has three schools—Riverside Elementary School, Jackson County Central High School and Minnesota West Community and Technical College, Jackson Campus. The city also has a library and two post offices. Jackson Municipal Utilities (JMU), a consumer-owned utility, provides public utilities such as electricity, water and sewer.

Jackson has a prosperous agricultural industry with Ag-Chem as its cornerstone, which plans to expand its agricultural equipment operations in Jackson. This has prompted the City to look into airport expansion. Currently the airport is adjacent to I-90. The transmission line route would traverse the existing airport approach zone; however, Xcel Energy's proposed facilities would not represent a conflict because the approach zone area is above the height of the planned structures. The airport expansion is still under study. Based on Xcel Energy's discussions with the City of Jackson, no significant conflicts for the proposed transmission line route are anticipated.

The City of Lakefield provides local police, fire and ambulance service to its residents. Lakefield has three schools: Immanuel Lutheran School, Jackson County Middle School and Pleasantview Elementary School. The city also has a local library and a post office. Lakefield provides electricity through the Lakefield PUC and water wells constitute the water source. People Service runs the local wastewater mechanical plant.

Alpha is the smallest of the four cities and relies mainly on the neighboring City of Jackson for many of its public services. Police, schools and libraries for Alpha are located in Jackson. The city's only public services involve a local city hall and a volunteer fire department. There is a post office in Alpha.

The City of Sherburn provides local police, fire and ambulance service to its residents. Martin County West High School and Sherburn Elementary School are located in the city. It has a library and a post office. Sherburn is serviced by municipal water and sewer. Alliant Energy provides electricity to Sherburn.

4.2.9.1 Potential Impacts

The Company will comply with all regulations related to siting the transmission line near the Jackson Municipal Airport and no impacts are anticipated to public services along the Project corridor.

4.2.9.2 Mitigative Measures

Measures have been taken in the siting of the line to ensure that the transmission lines are not within the airport approach zones. The existing runway approach zone extends south of I-90 and intersects the proposed transmission line route. Zoning requirements for the Jackson Municipal Airport will be complied with during the transmission line design process and the FAA will be notified per Part 77 of the Federal Aviation Regulations. Based on current zoning regulations, compliance is possible by adjusting the height and/or location of the transmission line poles.

Locating the line adjacent to I-90 in this area was avoided since there are clearance issues with the existing and proposed airport runways. The slope within the paved runway approach zone is 40:1. Xcel Energy reviewed the airport zoning regulations for the City of Jackson to determine structure height restrictions in the area. (See Appendix H.5-H.7 for the zoning regulations.) The north side of I-90 is within the existing paved runway approach zone, approximately 1950 feet from the runway. A pole at this distance would need to be less than 50 feet tall. The southern edge of I-90 is approximately 2200 feet from the runway within the paved runway approach zone area. At this distance, the poles would need to be less than 55 feet tall. The proposed new runway will be approximately 5000 feet long, and construction is proposed adjacent to the existing airfield, approximately 2500 feet north of I-90. Based on current zoning requirements the poles would need to be less than 60 feet on the north side of I-90 and less than 70 feet on the south side of I-90. (See Appendix D.10.)

The structures along the proposed route are outside of the airport approach zone for the existing airport and are expected to be outside of the airport obstruction zone for the

proposed expansion. The City of Jackson's Airspace Obstruction Zoning is attached in Appendix H.5-H.7. As additional information becomes available to Xcel Energy, we will forward that information to the EQB.

4.3 LAND-BASED ECONOMICS

4.3.1 AGRICULTURE

Jackson and Martin Counties are leading producers of many agricultural products in the State of Minnesota, particularly corn and hogs. The land is fertile, evidenced by the abundance of prime farmland present throughout the Project area. Where the proposed corridor crosses soils on agricultural land, all of the soils are considered prime farmland. According to the Minnesota NRCS,

> In general, prime farmland soils have an adequate and dependable water supply from precipitation or irrigation. They have a favorable temperature and growing season with acceptable levels of acidity or alkalinity, content of salt or sodium, and few or no rocks. They are permeable to water and air, are not excessively erodible and are not saturated with water for long periods of time. They do not flood frequently or are protected from flooding.

According to the 1997 Census of Agriculture, the number of farms in Jackson County was 963, of which 684 were farms with operators that farmed as their principal occupation. The number of full time farms in Jackson County decreased by 15 percent between 1992 and 1997. Martin County had 987 total farms in 1997, of which, 684 were full time farms. The number of full time farms in Martin County decreased by 19 percent between 1992 and 1997. The average size of farms in Jackson and Martin Counties are 398 and 426 acres, respectively. Martin County has seen a rather large increase in farm size, up 16 percent between 1992 and 1997.

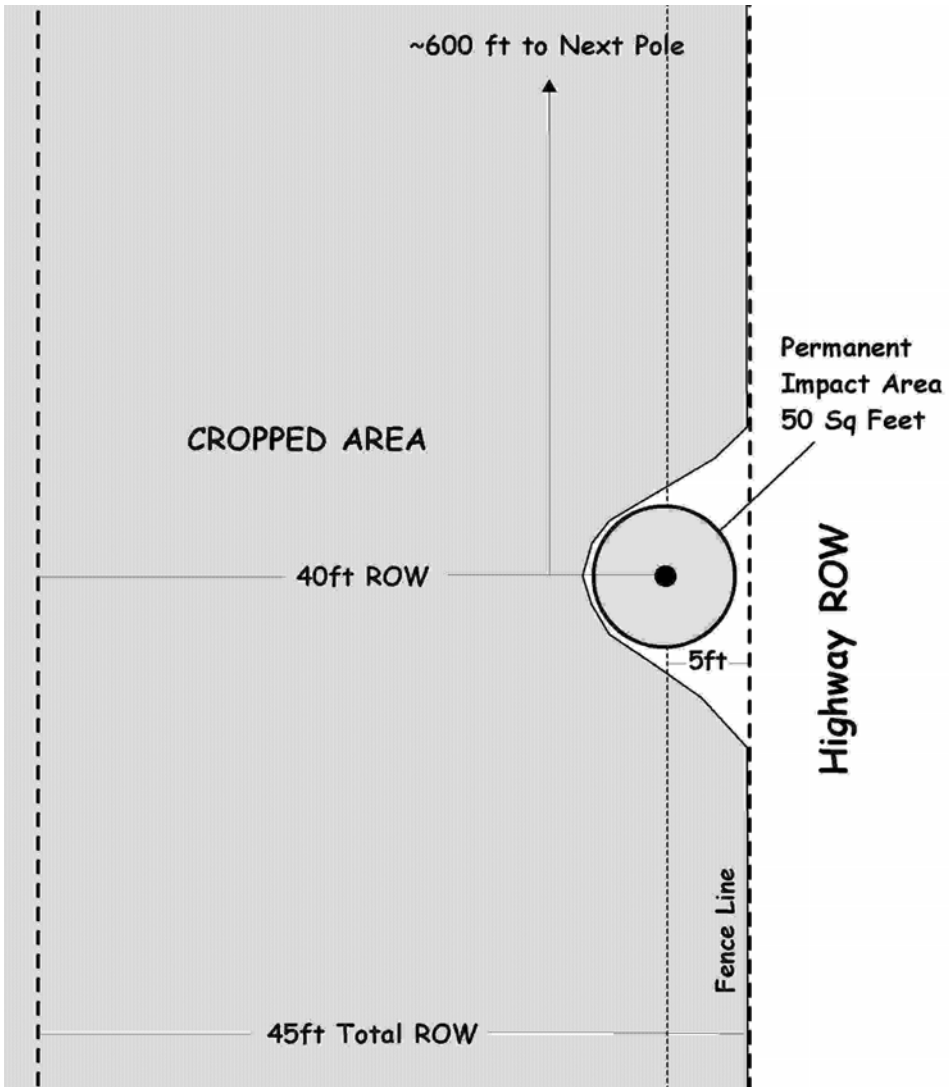
According to the 2002 Minnesota Agricultural Statistics Bulletin, Martin County is the number one producer of hogs and pigs and the number three producer of corn in the State. Jackson County ranks within the top ten in the state for these agricultural products as well. In Minnesota, Martin County is ranked third in the amount of revenue generated from the agricultural products they produce, earning over 285 million dollars in the year 2000.

4.3.1.1 Potential Impacts

Permanent impacts will occur to farmland throughout the corridor. However, these impacts will be minimal and will occur primarily due to pole placement. (See Figure 4.1.)

During construction, temporary impacts such as soil compaction and crop damages within the ROW are likely to occur. Approximately 67.13 acres of agricultural land will be impacted temporarily by the proposed Project. Permanent impacts to agricultural lands are estimated at 0.21 acres for the entire Project. Appendix E describes the land use impacts for the route in more detail.

Figure 4.1: Schematic of Poles and I-90 Route



4.3.1.2 Mitigative Measures

The route was chosen to minimize the impacts to farmland in the Project vicinity by closely following along much of the I-90 ROW fence line. Wherever possible poles will be placed close to the field margins and adjacent to the fence, approximately five feet from the highway ROW, to ensure minimal loss of farmland, and to ensure reasonable access to the land near the poles. Xcel Energy will attempt to construct the transmission line before crops are planted. Xcel Energy will compensate landowners for crop damage and soil compaction that occurs as a result of the Project. Soil compaction will be addressed by compensating the farmer to repair the ground or by using contractors to come in and chisel plow the site.

4.3.2 FORESTRY

The Project will be built in what was historically the prairie grassland region of Minnesota. The primary tree cover within the Project area occurs near the Des Moines River and consists of oak, ash, willow and elm trees.

4.3.2.1 Potential Impacts

There are no forested land based economies within the Project vicinity that will be affected.

4.3.2.2 Mitigative Measures

No mitigative measures will be necessary.

4.3.3 TOURISM

The three larger cities near the Project corridor, Lakefield, Jackson and Sherburn, have attractions such as museums and community festivals. The following describes the tourist attractions that are located adjacent to the Project corridor.

At Jackson, Fort Belmont is a replica of an 1860 fort with a museum, sod house, flourmill and chapel. A Mountain Man Rendezvous is held at the fort in spring and fall. The fort is on the south side of I-90 by the Des Moines River. It was moved to this location to provide easier access to the facility. The National Corn Cob Open is a golf tournament open to anyone associated with agriculture. It is held at courses in Jackson, Lakefield and Loon Lake in August.

4.3.3.1 Potential Impacts

Fort Belmont is located within the Project corridor on the south side of I-90 at Jackson. The proposed route follows an abandoned railroad corridor that passes behind the Fort. No impacts to area tourism are anticipated from the presence of the line.

4.3.3.2 Mitigative Measures

No mitigative measures are anticipated in regard to tourism.

4.3.4 MINING

The surficial deposits in the Project corridor are primarily end and ground moraines deposited by glaciers. The moraines are mostly silty, calcareous and shale-rich till. There are local lenses of sand and gravel within the till.

Glacial outwash and alluvium are present along the Des Moines River. Alluvium is also associated with other area streams and rivers. The glacial outwash is primarily shallow bouldery sand and gravel deposits in glacial melt water channels. The alluvium is composed of shallow surficial sand and gravel deposits and located along main drainages.

The depth to bedrock generally ranges from 200 to 500 feet in the Project corridor. The uppermost bedrock is either Precambrian undifferentiated crystalline rocks or Precambrian Sioux Quartzite, both overlain discontinuously by Cretaceous rocks. The Cretaceous rocks are generally siltstone and shale with some sandstone. Where present, this unit ranges from 25 to 200 feet thick.

The undifferentiated crystalline rocks are intermediate and mafic rocks with some granitic rocks. The Sioux Quartzite is a red and purple to light gray quartzite interbedded with red mudstone.

Mineral resources in the Project corridor consist of shallow sand and gravel deposits in moraines, outwash and alluvium. The underlying bedrock is too deep for economical extraction. The locations of former sand and gravel pits shown on topographic maps and in the Jackson and Martin County Soil Surveys indicate that most exploitable aggregate resources in the area are encountered along rivers and streams.

According to the MNDOT county pit maps for Martin and Jackson Counties, there are no active aggregate pits along the I-90 corridor. The majority of the former pits were located along the Des Moines River and the East Fork of the Des Moines River at or near I-90. Based on this, it appears that much of the aggregate resource along I-90 has already been exploited. There are three inactive pits along the highway in Jackson. Two of the inactive pits are on the north and south sides of I-90 in Section 14 of Township

102 North, Range 35 West. The third is on the south side of I-90 in Section 15, Township 102 North and Range 35 West. All three inactive pits appear to be within the Project corridor. (See Appendix D.11.)

4.3.4.1 Potential Impacts

The proposed transmission line will not impact active sand and gravel mining operations in the two counties.

4.3.4.2 Mitigative Measures

No mitigative measures are necessary because the Project will not impact any active sand or gravel pits.

4.4 ARCHAEOLOGICAL AND HISTORIC RESOURCES

In the Paleoindian period (circa 10,000 to 6,000 BCE), migratory groups of people moved into what would become Minnesota as the glaciers retreated. These people were likely highly mobile, hunting large herding mammals such as elk, mammoth and now-extinct forms of large bison and also likely relied on smaller game, fish and native plants.

In the following Archaic period (circa 6000 to 800 BCE), inhabitants continued to hunt large game but appear to have been less nomadic than the Paleoindian peoples. They also developed and advanced techniques associated hunting, trapping, fishing, foraging, woodworking and plant processing. Settlements were often along lakes and rivers.

In the Woodland period (circa 800 BCE to historic contact) plant domestication was beginning. Settlement continued to focus on bodies of water. The development of pottery and use of burial mounds occurred during this time.

In the late Woodland period, most of the southern peoples in Minnesota transitioned to a way of life more typical of the Mississippian societies to the south. A primary characteristic of these Mississippian groups was the cultivation of corn. Again, the main settlements appeared to have been along major rivers or other water bodies. These newly emergent cultures appear to have been the predecessors of the Native Americans present at the time of first European contact.

The first Europeans to travel into southwestern Minnesota were likely French fur trappers and traders in the late 1600's or early 1700's. At the time, the primary indigenous peoples were the Dakota. Following the Treaty of Paris in 1763, control of the region passed to the British and then to the United States in 1783.

Individuals of a European background settled permanently in this region in the mid-1800's, primarily from other regions of the United States. Following the Civil War, European immigrants came to the area. Many of these immigrants were from northern European countries, particularly Norway. The majority of the settlers came to farm. Jackson, the county seat of Jackson County, is at the location of the earliest white settlement within the area. This community, initially named Springfield, was the site of a trading post built on the Des Moines River in 1856. Martin and Jackson Counties were both established in 1857. Lakefield was founded in 1879 with the completion of the railway to this point. Sherburn was incorporated as a village in 1879. Alpha was incorporated in 1899.

4.4.1.1 Potential Impacts

A search of the Minnesota State Historic Preservation Office (SHPO) database identified 59 historic architectural sites and three archaeological sites within one mile of the proposed route. None of these sites are in the Project corridor. Therefore, no impacts are anticipated.

Xcel Energy sent a letter to the Minnesota SHPO requesting a review of the proposed Project for known archaeological and historic resources within the Project area. The SHPO confirmed the Company's conclusion that, "there are no properties listed on the National or State Registers of Historic Places, and no known or suspected archaeological properties in the area that will be affected by this Project." A copy of the response letter is attached in Appendix G.3.

4.4.1.2 Mitigative Measures

No impacts are anticipated; therefore, no mitigation is needed.

4.5 NATURAL ENVIRONMENT

4.5.1 AIR QUALITY

There are minimal air quality impacts associated with transmission line construction and operation.

The only potential air emissions from a transmission line result from corona. Corona can produce ozone and oxides of nitrogen in the air surrounding the conductor. Corona consists of the breakdown or ionization of air in a few centimeters or less immediately surrounding conductors. For a 161 kV transmission line, the conductor gradient surface is usually below the air breakdown level. Usually some imperfection such as a scratch on the conductor or a water droplet is necessary to cause corona. Ozone also forms naturally in the lower atmosphere from lightning discharges and from reactions between

solar ultraviolet radiation and air pollutants such as hydrocarbons from auto emissions. The natural production rate of ozone is directly proportional to temperature and sunlight and inversely proportional to humidity. Thus, humidity (or moisture), the same factor that increases corona discharges from transmission lines, inhibits the production of ozone. Ozone is a very reactive form of oxygen and combines readily with other elements and compounds in the atmosphere. Because of its reactivity, it is relatively short-lived. The Project area presently meets all federal air quality standards.

4.5.1.1 Potential Impacts

Currently, both state and federal governments have regulations regarding permissible concentrations of ozone and oxides of nitrogen. The national standard is 0.08 ppm on an eight-hour averaging period. The state standard is 0.08 ppm based upon the fourth-highest eight-hour daily maximum average in one year. Calculations using the Bonneville Power Administration (BPA) Corona and Field Effects Program Version 3 (USDOE, BPA Undated) for a standard single circuit 161 kV Project predicted the maximum concentration of 0.008 ppm near the conductor and 0.0003 ppm at one meter above ground during foul weather or worst-case conditions (rain at 4 inches per hour). During a mist rain (rain at 0.01 inch per hour) the maximum concentrations decreased to 0.0003 ppm near the conductor and 0.0001 ppm at one meter above ground level. For both cases, these conservative calculations of ozone levels are well below the federal and state standards. Studies designed to monitor the production of ozone under transmission lines have generally been unable to detect any increase due to the transmission line facility. Given this, there will be no measurable impacts relating to ozone for the Project.

During construction of the proposed transmission line and substation, there will be limited emissions from vehicles and other construction equipment and fugitive dust from ROW clearing. Temporary air quality impacts caused by the proposed construction-related emissions are expected to occur during this phase of activity.

The magnitude of the construction emissions is influenced heavily by weather conditions and the specific construction activity occurring. Exhaust emissions from primarily diesel equipment will vary according to the phase of construction but will be minimal and temporary. Adverse impacts to the surrounding environment will be minimal because of the short and intermittent nature of the emission and dust-producing construction phases.

4.5.1.2 Mitigative Measures

Xcel Energy does not anticipate significant impacts to air quality; therefore, no mitigation is necessary.

4.5.2 WATER QUALITY

The majority of the Project corridor lies in the Des Moines River watershed. The western four to five miles straddle the Rock River and Des Moines River watersheds. A small portion of the corridor, in the northwestern corner of Township 102N, Range 34W, is in the Blue Earth River watershed.

The Project corridor line passes between Boot and Clear Lakes in Jackson County and terminates at the Fox Lake Substation between Fox and Temperance Lakes in Martin County. It crosses the Des Moines River, the East Fork of the Des Moines River, the South Fork of Elm Creek and their tributaries. The corridor also crosses several ditches that drain to these waterways. The Des Moines River and the East Fork of the Des Moines River are identified as Public Waters on the Public Waters Inventory maps. (See Appendix D.11.)

There are wetlands along or near the current transmission line. Within the proposed Project corridor the National Wetlands Inventory (NWI) identifies nine wetlands that could be potentially impacted by the proposed Project. (Appendix D.11). Many of these are hydrologically connected to area lakes, river and streams.

Water quality data from 1998 from the United States Geological Survey (USGS) for the Des Moines River at Jackson is summarized in the table below.

Table 4.6
Water Quality of Des Moines River at Jackson, Minnesota
August 1998

Parameter (units)	Concentration
Oxygen (mg/L)	6.6
pH (standard units)	8.6
Carbonate, dissolved (mg/L as CO3)	41
Bicarbonate, dissolved (mg/L as HCO3)	88
Nitrogen Ammonia, dissolved (mg/L as N)	0.085
Nitrogen Nitrite plus Nitrate, dissolved (mg/L as N)	< 0.05
Phosphorus, dissolved (mg/L as P)	0.046

< = parameter not detected at or above indicated lower detection limit

Similar quantitative water quality data were not found for the other surface waters in the Project corridor. However, qualitative assessments of area surface water quality were available from the MPCA website. Table 4.7 is a summary of these assessments for waters in the Project corridor.

Table 4.7
Surface Water Quality Assessment

Water Body	Water Quality	Trophic State (Lakes)	Aquatic Life	Swimming
Clear Lake	Good	Hypereutrophic	Not Available	Partially Supported
Des Moines River	Poor[1]	Not Applicable	Not Supported	Not Assessed
East Branch of Des Moines River	Poor[2]	Not Applicable	Not Supported	Not Assessed
Fox Lake	Poor[3]	Hypereutrophic	Fish Consumption Advisory[3]	Not Supported

1 On MPCA 2002 Impaired Waters List (per Section 303(d) Clean Water Act) due to ammonia, low oxygen and turbidity.

2 On MPCA 2002 Impaired Waters List (per Section 303(d) Clean Water Act) due to turbidity.

3 Fish consumption advisory issued due to mercury in walleye and carp and PCBs in carp.

4.5.2.1 Potential Impacts

Minimal temporary impacts to wetlands may occur if these areas need to be crossed during construction of the transmission line.

During construction, there is the possibility of sediment reaching surface waters as the ground is disturbed by excavation, grading and construction traffic. Once the Project is completed, it will have no impact on surface water quality.

4.5.2.2 Mitigative Measures

Xcel Energy will implement practices during construction, when necessary, to prevent sediment from entering the surface waters listed above. Transmission line poles will not be placed in wetlands. Where possible, construction crews will avoid crossing wetland areas. Where such crossings are necessary, wooden mats will be used, where appropriate, to decrease compaction. Crossing of streams with equipment will be avoided to the greatest extent practicable. Construction equipment will not cross the Des Moines River and the East Fork of the Des Moines River. As a result of these measures, minimal impacts to wetlands and waters are anticipated.

4.5.3 FLORA

The land adjacent to the Project is primarily cultivated land and is also developed throughout a majority of the route. Areas along the corridor that could potentially provide habitat for native plant species are near the Des Moines River, along the abandoned railroad corridor, the East Fork of the Des Moines River, Clear Lake and Fox Lake.

The Des Moines River is the most prominent natural feature within the Project area. The Des Moines River area flows through a plateau called the Coteau de Prairies. North of the Project area, the river valley is bound by low hills and vegetation. As the river approaches the City of Jackson, the area becomes oak woodland and basswood forest habitat. The hills become taller, forming bluffs. The understory within the oak woodland and basswood forest typically consists of shrub species such as chokecherry (*Prunus virginiana*) and dogwood (*Cornus spp.*). Within the area where the transmission line will be located, silver maple (*Acer saccharinum*), green ash (*Fraxinus pennsylvanica*), willow (*Salix spp.*), elm (*Ulmus sp.*) and box elder (*Acer negundo*) were identified.

A majority of the vegetation surrounding the Project corridor is agricultural land. This land was once a part of the prairie grassland region of Minnesota. Jackson and Martin counties separate the southwestern and southeastern prairie regions of Minnesota. Historically, these regions consisted of dry and mesic prairies with plants such as big bluestem (*Andropogon gerardii*), prairie dropseed (*Sporobolus heterolepis*), indiangrass (*Sorghastrum nutans*) and cordgrass (*Spartina pectinata*) intermixed with a variety of forbs. Only remnants of these areas now remain. A degraded prairie fragment is present along the railroad ROW in Jackson. For more information on this fragment, please see Section 4.6.

Several woodlots associated with homesteads, comprised primarily of box elder, were identified within the Project corridor. Appendix D.11 identifies the Natural Resources in the Project area.

4.5.3.1 Potential Impacts

Flora within habitats along the Project corridor are typical of what will be found in an agricultural and urban setting. Since the Project will occur along roads, agricultural lands and urban areas that have been previously disturbed, no impacts are anticipated to native vegetation.

4.5.3.2 Mitigative Measures

Xcel Energy will maintain sound water and soil conservation practices during construction and operation of the Project to protect topsoil and adjacent water resources and minimize soil erosion. Practices may include containing excavated material; protecting exposed soil and stabilizing restored soil. The Company will avoid major disturbance of individual wetlands and drainage systems during construction. This will be done by spanning wetlands and drainage systems where possible. Where wetlands need to be crossed by equipment, Xcel Energy will use wooden mats to minimize impacts.

Xcel Energy will minimize tree felling and shrub removal near the Des Moines River by removing only trees that would impact the safe operation of the facility.

4.5.4 FAUNA

Most of the land adjacent to I-90 is either developed or cultivated. Areas along the I-90 corridor that could potentially provide habitat for local species are near the Des Moines River, East Fork of the Des Moines River, Clear Lake and Fox Lake.

There are many WMAs, Waterfowl Protection Areas (WPA) and county parks within the Project vicinity. A State Game Refuge is within the transmission line corridor and surrounds the Fox Lake area. State Game Refuges are public lands, waters, highways and ROW that are protected areas for wildlife within the game refuge boundary. Only under Minnesota Statute 97A.091 can a refuge be used as hunting grounds. The Fox Lake WMA is located adjacent to the proposed route. WMAs are managed for wildlife production and are open to hunting and wildlife watching. A DNR waterfowl wetland enhancement Project is also located near the existing substation at Fox Lake. The Game Refuge, WMA and wetland enhancement Project near Fox and Temperance Lakes are primarily home to small game and waterfowl. Appendix D.11 identifies the Natural Resources in the Project area.

Fauna known to inhabit the Des Moines River area are white tailed deer, beaver, squirrel, mink, muskrat and turtles. Avian populations consist of those typical of riparian areas including many passerines: Baltimore orioles (*Icterus galbula galbula*) and bank swallows (*Riparia riparia*)), waterfowl such as wood duck (*Aix sponsa*) and mallards (*Anas platyrhynchos*), owls, hawks, blue herons (*Ardea herodias*) and kingfishers (*Ceryle alcyon*). The river is home to northern pike (*Esox lucius*), walleye (*Stizostedion vitreum*), crappie (*Pomoxis sp.*), channel catfish (*Ictalurus punctatus*), yellow perch (*Perca flavescens*) and black bullheads (*Ameiurus melas*).

4.5.4.1 Potential Impacts

There is minimal potential for the displacement of wildlife and loss of habitat from construction of the Project. Wildlife that inhabit natural areas such as those near the Des Moines River could be impacted in the short term within the immediate area of construction. The distance that animals will be displaced will depend on the species. Impacts to wildlife are anticipated to be short-term since the route primarily will be constructed along an existing highway ROW. Additionally, these animals will be typical of those found in agricultural and urban settings, and should not incur population level effects due to construction. Impacts to the wooded areas near the Des Moines River and the small woodlots near the Project corridor will be avoided when possible. Routes

were chosen to avoid these areas to the greatest extent practicable. There are no woodlots located within the proposed ROW that will be impacted.

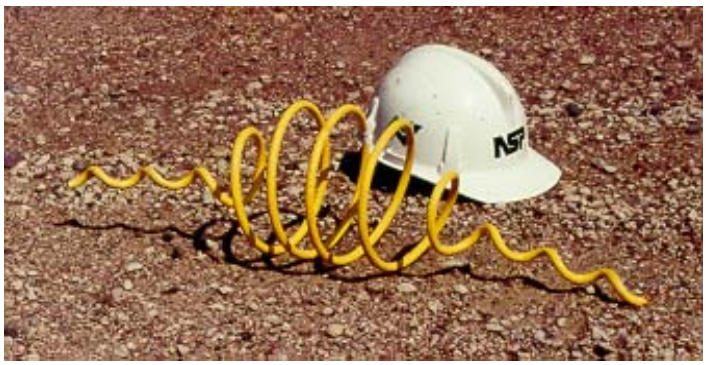
Raptors, waterfowl and other bird species may also be affected by the construction and placement of the transmission lines. Avian collisions are a possibility after the completion of the transmission line. Waterfowl are typically more susceptible to transmission line collision, especially if the line is placed between agricultural fields that serve as feeding areas, or between wetlands and open water, which serve as resting areas.

Additionally, large birds, such as raptors, could potentially be impacted by new transmission lines through electrocution. Electrocution occurs when birds with large wingspans come in contact with either two conductors or a conductor and a grounding device. Xcel Energy transmission line design standards provide adequate spacing to eliminate the risk of raptor electrocution.

4.5.4.2 Mitigative Measures

The Minnesota DNR expressed concern about impacts to Canada geese that use the Statutory Game Refuge on and around Fox Lake. The DNR's letter regarding this issue is attached in Appendix G.2. The DNR suggested H-frame structures as a mitigative measure. H-frame structures for single circuit lines are generally more visible to the birds as they approach or take off from a waterway. However, as described in Section 3.1, Xcel Energy is proposing a double circuit structure in this area. In most cases, the shield wire of an overhead transmission line is the most difficult part of the structure for the bird to see. Xcel Energy has had success in reducing collisions on transmission lines by marking the shield wires with swan flight diverters (SFD). SFDs are preformed spiral shaped devices made of polyvinyl chloride that are wrapped around the shield wire. (Figure 4.2). While an H-frame structure cannot be accommodated, the placement of SFDs on structures in this area will address the DNR's concerns. Xcel Energy will install swan flight diverters on the shield wire of the line from Highway 4 to the Fox Lake Substation.

Figure 4.2: Swan Flight Diverter



4.6 RARE AND UNIQUE NATURAL RESOURCES

The following is a list of rare or unique resources identified within one mile of the Project area. These resources were identified using the DNR Natural Heritage Database.

Table 4.8
Rare and Unique Resources

Common Name	Number of Occurrences	Scientific Name	Federal Status[1]	MN Status[2]	State Rank[3]
Arogos skipper	1	*Atrytone arogos*		SPC	S3
Dry prairie (southwest) hill subtype	1	N/A			S3
Mesic prairie (southwest)	6	N/A			S2
Prairie bush clover	1	*Lespedeza leptostachya*	LT	THR	S2
Rattlesnake-master	1	*Eryngium yuccifolium*		SPC	S3
Sullivant's milkweed	6	*Asclepias sullivantii*		THR	S2

1) LT: Listed Threatened
2) THR: Threatened
   SPC: Special Concern
3) State Rank: A rank assigned to the natural community type, which reflects the known extent and condition of that community in Minnesota. Ranks range from 1 (in greatest need of conservation action in the state) to 5 (secure under present conditions)

Many of the rare and unique resources identified within the Project area are associated with remnants of prairie land, which were once abundant in this area of Minnesota. Approximately 99 percent of the prairie that was present in the State before settlement has been destroyed and one-third of Minnesota's endangered, threatened and special concern species are dependent on the fragments of prairie that remain.

During a field inspection of the route, a possible low to moderate quality native prairie fragment was identified along the old railroad grade. Species observed were prairie cord grass (*Spartina pectinata*), Indian grass (*Sorghastrum nutans*), (*Solidago rigida*), pasture rose (*Rosa carolina*) and other forbs. The fragment has been invaded by thistles and is adjacent to the industrial park and other developed areas in Jackson. The Minnesota DNR was contacted about the prairie fragment, and concurred that no survey was needed for the Project due to its degraded state.

4.6.1 POTENTIAL IMPACTS

The Minnesota DNR and the U.S. Fish and Wildlife Service did not identify any potential impacts to rare, threatened, or endangered species within the Project corridor. The closest identified resource is half a mile from the Project area; therefore no impacts to rare and unique resources are anticipated for the proposed Project. A copy of the Company's correspondence with these agencies is attached in Appendix G.1, G.2 and G.4.

In its letter dated October 13, 2003, the DNR restated that the Project would not impact known occurrences of rare features.

4.6.2 MITIGATIVE MEASURES

The DNR has requested that Xcel Energy revegetate disturbed soil adjacent to and within the prairie fragment with native prairie species. Revegetating in this manner will improve the quality of the remnant while decreasing the opportunity for exotic species to invade the area. It is not anticipated that additional mitigative measures will be necessary.

5.0 AGENCY INVOLVEMENT, PUBLIC PARTICIPATION AND REQUIRED PERMITS AND APPROVALS

5.1 AGENCY CONTACTS

Refer to Appendix G for agency correspondence letters. Several agencies were contacted for their input on the Project.

5.1.1 MINNESOTA DEPARTMENT OF NATURAL RESOURCES

The Minnesota DNR Natural Heritage and Non-game Research Program was contacted to review the Project area for State threatened and endangered species and rare natural features. The DNR did not identify any rare features within the Project corridor along I-90. (See Appendix G.1.) On October 13, 2003, the Natural Heritage and Non-game Research Program responded to a letter from Xcel Energy regarding a degraded prairie fragment identified within the Project area. The DNR concurred with the Company and stated that no survey was needed for additional prairie remnants, and reiterated that no impacts to known occurrences of rare features were anticipated.

The Minnesota DNR, Region 4 was contacted to obtain comments on the proposed Project and to clarify DNR property information. Xcel Energy met with the DNR on June 11, 2003 to discuss the Project. Written comments provided by the Environmental Assessment Ecologist (see Appendix G.2) included its opinion that the I-90 route appeared to offer the fewest environmental problems. Other comments were related to the Canada Geese at the Statutory Game Refuge on and around Fox Lake. The DNR suggested the use of H-frame structures and swan flight diverters near the Game Refuge to protect these animals. More detail on this issue is found in Section 4.5.4.

5.1.2 MINNESOTA SHPO

The SHPO was asked to review the proposed Project area for possible effects to known or potential sites of archaeological or historical significance. The SHPO did not identify any known National Register of Historic Places (NRHP) properties or archaeological properties that would be affected by the proposed Project (Appendix G.3).

5.1.3 USFWS

The United States Fish and Wildlife Service (USFWS) provided a review of the Project area for federally threatened and endangered species. The agency did not identify any threatened or endangered species or environmental concerns associated with the Project. (See Appendix G.4.)

5.1.4 MINNESOTA DEPARTMENT OF TRANSPORTATION

Since a large portion of the proposed route is adjacent to MNDOT ROW, the MNDOT, District 7, was asked to identify issues relating to the transmission line adjacent to I-90 and its interchanges. In a letter dated April 28, 2003, MNDOT identified concerns associated with the transmission line being sited along I-90. Copies of correspondence letters with MNDOT are attached in Appendix G.5. The primary concerns MNDOT raised were interference with MNDOT communication devices and overhang of the transmission line on MNDOT ROW. Concerns about MNDOT communication devices included interference with spread spectrum radios, interference due to dirty insulators, shadowing of Radio Frequency (RF) signals, interference with AM/FM broadcasts and interference of secondary sources such as fences near the transmission lines. For spread spectrum radios, Xcel Energy does not anticipate any problems due to the presence of the transmission line since the Company has used spread spectrum radios to transmit data to and from its substations and has not experienced any interference. If a problem does occur, Xcel Energy would work with the MNDOT to alter the placement of the receiver and alleviate the problem.

Dirty insulators have been known to cause interference more commonly on lower voltage lines with less insulation and lower profiles. In the case of the Lakefield Junction – Fox Lake 161 kV transmission line, only a combination of factors will create this unlikely scenario. For instance, if salt were heavily applied to roads and the wind were blowing in the direction of the line, which is in close proximity to the roadway, and the elevation of the insulators was not much greater than the elevation of the roadway, then salt could possibly be deposited on the insulators, causing some interference. This is unlikely and the Company does not expect such interference as a result of this Project.

MNDOT stated its concern that the proposed transmission line will cause interference of the RF signal for both VHF (150 MHz) and 800 MHz radio coverage. Xcel Energy has numerous miles of 345 kV and 115 kV transmission lines within the Twin Cities metro area in close proximity to State highways, and this problem has not arisen.

The most common RF interference is with AM reception. This is routinely related to problems with hardware on older, lower voltage transmission lines and is minimized by modifying the hardware. The new 161 kV transmission line will likely cross the highway twice, which will mean drivers will pass underneath it in two places. At these crossover points, drivers may notice a temporary blockage of the AM radio signal. Reception will resume once the radio is away from the line.

Xcel Energy is not aware of any instances where fences have become a secondary source of interference. When transmission lines are constructed, all fences are grounded, and

Xcel Energy recommends new fences be grounded whenever they are built near transmission lines to avoid this problem.

MNDOT also expressed concerns about portions of the transmission line overhanging the MNDOT ROW. Xcel Energy has proposed the transmission line structures be placed approximately five feet from the MNDOT fence on private property. This will help minimize impacts to landowners. If the poles are placed further out to avoid overhanging on MNDOT ROW, they will have a greater impact on farming operations since the farmers will need to maneuver their equipment around the poles. Impacts to farming operations are decreased the closer the poles are to the fences.

Xcel Energy met with MNDOT on October 16, 2003 to discuss the issues they identified in their April 2003 letter. Items discussed in the meeting and the outcome of those discussions included below:

- Snow Drifting Concerns: MNDOT was concerned about siting the transmission line structures on the northwest side of the I-90 and County Road 34 intersection. Xcel proposes to route the line on the southeast side of the road at this location. The living snow fence of trees and shrubs will not be affected by the proposed Project.

- Xcel Energy's Written Response to MNDOT's Concerns, Dated August 15, 2003: MNDOT stated that Xcel Energy addressed the MNDOT Office of Electronic Communication's concerns regarding the proposed Project.

- Routing through Interchanges: MNDOT has asked Xcel Energy to route around and not through the interchanges along I-90. Only in cases of hardship will they allow the line to be built through the interchanges. Xcel Energy will work to accommodate this request and will only propose going through interchanges in cases where it would significantly reduce routing impacts.

- Construction Access: MNDOT has asked Xcel Energy not to use or cross highway ROW for line construction except under hardship and Xcel Energy will comply with this request.

- ROW Fencing: Xcel Energy or its contractor must repair any breech in ROW fencing as soon as possible.

By the close of the meeting, MNDOT stated that Xcel Energy had sufficiently addressed MNDOT's concerns regarding the proposed Project along I-90.

5.1.5 MINNESOTA DEPARTMENT OF TRANSPORTATION, OFFICE OF AERONAUTICS

The MNDOT Office of Aeronautics was contacted to confirm height restrictions for the Jackson Municipal Airport and provide comments related to airport zoning requirements. No response was received.

5.1.6 CITY OF JACKSON

Xcel Energy contacted the City of Jackson several times, and extended invitations to the public meetings and organized meetings about the airport expansion and planned development in Jackson. The City submitted comments on Xcel Energy's preliminary routes after the public information meeting held this past spring, which are provided in Appendix G.6. Xcel Energy followed up with several phone calls and meetings with the City to discuss the proposed route in that area. Xcel Energy has attempted to address the City's needs by proposing the route along the abandoned railroad. The Company believes this proposal addresses the majority of the City's concerns. However, the City also has indicated that they would also like Xcel Energy to consider burying the transmission line through Jackson. Undergrounding the facility in that area would cost $8 to $12 million. Xcel Energy did indicative estimates for undergrounding the line along I-90 from the point just after the line crosses the Des Moines River to a point just west of County State Aid Highway 23. Initial estimates show a single circuit 161 kV line constructed underground would cost approximately $8 million. If the proposed 69 kV line were also buried, the costs would be approximately $12 million. These costs include the transmission lines, a spare cable and the converter stations. Xcel Energy does not believe that passing along the high costs of such a proposal to all Xcel Energy customers is justified. In other cases where one community has sought to have lines placed underground, the community has paid the additional costs for doing so. Jackson has not made such a proposal to Xcel Energy.

In addition, the City was contacted to obtain zoning requirements for the airport in the City of Jackson. These zoning requirements were received via fax and are included as Appendix H.5-H.7.

5.1.7 TRIBAL GROUPS

When projects require Federal permits, contacts with tribes are done to comply with Section 106 of the National Historic Preservation Act of 1966 (and its amendments) and 36 CFR 800, procedures on the Advisory Council on Historic Preservation. There are no Federal permits anticipated for this Project, but a courtesy contact was made to solicit comments. The following entities representing tribes with interests within the Project area were contacted to obtain comments in relation to the Project:

- Flandreau Santee Sioux
- Lower Sioux Indian Community Council
- Prairie Island Community Council
- Santee Sioux Tribe of Nebraska
- Sisseton-Wahpeton Dakota Nation
- Spirit Lake Tribal Council
- Upper Sioux Community of Minnesota

No responses were received.

5.1.8 MINNESOTA DEPARTMENT OF AGRICULTURE

The Minnesota Department of Agriculture was asked to review the Project and provide comments on the transmission line improvements prior to filing this application. No response was received.

5.1.9 MINNESOTA POLLUTION CONTROL AGENCY

The Minnesota Pollution Control Agency was contacted to review the Project and provide comments on the transmission line improvements prior to filing this application. No response was received.

5.2 PUBLIC PARTICIPATION

5.2.1 INFORMATION MEETINGS

Xcel Energy conducted a public meeting, prior to submission of the route permit application, on April 23, 2003 in Jackson, Minnesota. Seventy-eight people registered at the meeting. The materials provided at the meeting are provided in Appendix I. Landowners and interested persons received materials describing the Project, right-of-way practices and line design. Route maps were available that showed the proposed and rejected routes. Landowners also were provided a comment form to provide written comments to Xcel Energy about concerns or comments they had about the Project. Xcel Energy also received several phone calls about the Project. A summary table of written and oral comments is included in Appendix G.7-G.10. Overall the primary concerns raised were impacts to landowners along the rejected Alliant Energy line route (i.e., paralleling the existing 161 kV line).

After the meeting, Ag-Chem and the City of Jackson followed up with letters to Xcel Energy regarding the Project. (See Appendix G.11.) Ag-Chem was concerned that the proposed line would hinder expansion projects that may happen in the future, and proposed that the line run along the railroad tracks south of the Ag-Chem Jackson Operations property instead of along I-90 or the frontage road near its main building. The City of Jackson preferred the rejected 161 kV route to the proposed I-90 route. However, the City acknowledged that if the Jackson airport were expanded as planned, and that route selected, the transmission lines would encroach upon the runway approach zone. The City was also concerned about the line encroaching on the approach zone of the airport near I-90 and impacting the appearance of the industrial zone, which currently has all of its electrical lines buried.

5.2.2 CITIZENS ADVISORY TASK FORCE

The EQB has the authority under Minnesota Rules 4400.1600, Subp. 1 to designate a Citizens Advisory Task Force (CATF). The task force is advisory and provides input to the MEQB in evaluating the Route Permit Application and in determining the scope of the Environmental Assessment (EA) and route selection. Xcel Energy agreed to establish the CATF prior to filing the Route Permit Application. A CATF was designated for the Lakefield Junction – Fox Lake Transmission line on May 14, 2003. The CATF has gathered for three meetings held on August 27, 2003, September 10, 2003 and September 24, 2003. The following outlines the responsibility of the task force as identified by the EQB in its "Citizen Advisory Task Force Decision and Scope of Participation," In the Matter of the Application By Xcel Energy for a Route Permit for a New 161 kV High Voltage Transmission Line Between Lakefield Junction and Fox Lake Substation in Southwest Minnesota:

> The charge to the Task Force shall be to identify additional routes, and particular impacts to be evaluated in the environmental review process. In particular the Task Force should consider whether routes along Town Roads such as 810th street and 830th street should be included in the review, and whether consideration of routes crossing the Des Moines River at Highway 16 should be considered. The Task Force should also consider how the line could be routed along any route corridors identified by Xcel Energy, including an examination of routing issues near the City of Jackson Airport. The Task Force should express a preference for a specific route if it has one. The Task Force should complete its review and report to the Board no later than 60 days after the date of acceptance of a completed application.

The Task Force must include local representation. Members of the CATF include the following organizations:

- The Southwest Regional Development Commission (Craig Rubis, Richard Peterson (alternate))
- The Region Nine Development Commission (Peggy Wiese)
- The City of Jackson (Dean Albrecht, Steve Walker (alternate))
- The City of Sherburn (Kathy Bailey)
- Jackson County (Gordon Olson, John Nauerth (alternate))
- Martin County (Harry Jenness)
- Jay Township, Martin County (Steve Roben)
- Two landowners from along the proposed route (not appointed yet) and two landowners from the Alliant Energy route (Steve Fransen and Lisa Lusk)

The CATF has suspended meetings until Xcel Energy files its application. The CATF will continue to meet until its review is completed, sixty days following the MEQB's acceptance of this route application.

5.2.3 IDENTIFICATION OF LAND OWNERS

Landowner names are provided in Appendix J. There are 121 landowners along the proposed route included in this application. This includes landowners on both sides of I-90. This does not include landowners along the rejected route.

5.3 REQUIRED PERMITS AND APPROVALS

Table 5.1 shows the permits potentially required for the Project.

Table 5.1
Potential Required Permits

Permit	Jurisdiction
Local Approvals	
Utility Permit-road crossings	Jackson County
Utility Permit-road crossings	Martin County
State of Minnesota Approvals	
Route Permit Application (Alternative Process)	EQB
Utility Permit (highway crossings)	MNDOT
License to Cross Public Waters	MN-DNR Division of Lands and Minerals
NPDES Permit	MPCA
Federal Approvals	
Notice of Proposed Construction or Alteration	Federal Aviation Administration

5.3.1 LOCAL APPROVALS

Jackson County Utility Permit

A Utility Permit is required for road crossings and any work along a county road ROW. Xcel Energy will file for these permits once the line design is complete.

Martin County Utility Permit

A Utility Permit is required for crossings perpendicular to and within the county ROW. The structures must be set back 130 feet from the county road centerline. Xcel Energy will file for these permits once the line design is complete.

5.3.2 STATE OF MINNESOTA APPROVALS

Route Permit (Alternative Process)

A HVTL cannot be constructed without a route permit approved by the EQB. A route permit under the Alternative Process requires the applicant to be eligible as outlined in Minnesota Rules 4400.2000.

Utility Permit

A permit from the MNDOT is required for construction, placement, or maintenance of utility lines to be placed adjacent or across the highway ROW. These permits will be acquired once the line design is completed.

License to Cross Public Waters

The Minnesota DNR Division of Lands and Minerals regulates utility crossings over, under, or across any state land or public water identified on the Public Waters and Wetlands Maps. A license to cross Public Waters is required under Minnesota Statue, Section 84.415 and Minnesota Rules, Chapter 6135. Xcel Energy works closely with the DNR on these permits and will file for them once the line design is complete.

NPDES Permit

A National Pollutant Discharge Elimination System (NPDES) permit is required for storm-water discharges associated with construction activities disturbing soil and equal to or greater than one acre in an area. A requirement of the permit is to develop and implement a Storm-water Pollution Prevention Plan (SWPPP), which includes Best Management Practices (BMPs) to minimize discharge of pollutants from the site. This permit will be acquired if any of the substation work impacts more than one acre, which is not anticipated at this time.

5.3.3 FEDERAL APPROVALS

Notice of Proposed Construction or Alteration

A Notice of Proposed Construction or Alteration is required for construction within six miles of a Public Aviation Facility and for structures over 200 feet which are within 20,000 feet of an airport with a runway more than 3,200 feet in length, and where the transmission line structures would exceed a slope of 100:1 horizontally from the nearest point of the nearest runway. A 7460 Proposed Construction or Alteration Form will need to be completed prior to construction due to the line's proximity to the Jackson Municipal Airport.

Xcel Energy will acquire the permits listed above once the Project route is approved by the EQB and the line design is complete.

6.0 SUMMARY OF FACTORS TO BE CONSIDERED

In determining whether to issue a permit for a high voltage transmission line, the EQB considers 14 factors, which are listed in Minnesota Rule 4400.3150. Because a CON has been granted by the PUC for the proposed line, questions of need, including size, type, timing, alternative system configurations and voltage are not to be considered. (Minnesota Rule 4400.3250.) A discussion of each of the relevant factors as they relate to the Project is provided below.

A. Effects on human settlement and aesthetics, including but not limited to, displacement, noise, aesthetics, cultural values, recreation and public services

The proposed route will have minimal impact on buildings in the Project area and will result in no displacement of existing homes or businesses. The noise related to the proposed line will be minimal, as described in Section 4.2.4 of this Application. The primary impacts from the Project will be aesthetic. The proposed transmission line may be visible in the areas of Clear Lake and Fox Lake, and the line will pass next to the Jackson Golf Club. Impacts to aesthetics will be minimized by placing the line along the Interstate and by utilizing shorter structures at the Des Moines River crossing. Aesthetic impacts to existing businesses along I-90 near Jackson will be minimized by placing the line along the abandoned railroad corridor behind Fort Belmont and Ag-Chem, which abuts I-90. The Project will have no impact on cultural values or public services within the Project corridor. The only impact to recreation is the aesthetic impact identified above.

B. Effects on public health and safety

No effects on public health or safety are anticipated. The proposed line will be constructed to comply with NESC and all Company guidelines and standards. The 161 kV line will have a maximum magnitude of field density of approximately 1.1 kV per meter underneath the conductors one meter above the ground, significantly less than the EQB's standard of 8 kV. The EQB standard was designed to minimize the hazard of shocks from the line touching large objects under extra high voltage transmission lines of 500 kV or greater. Moreover, the most recent scientific studies on EMF have not found any significant link between EMF and health effects.

C. Effects on land-based economies, including, but not limited to, agriculture, forestry, tourism and mining

The Project will impact farmland throughout the corridor primarily due to pole placement. Approximately 67.13 acres of agricultural land will be temporarily impacted; approximately 0.21 acres will be permanently impacted. The proposed route along the Interstate minimizes these impacts. Poles will be placed approximately five feet from the

existing highway ROW and close to field breaks and fence lines where possible to minimize land loss. Construction may also result in soil compaction, which will be mitigated by payments to the farmer or a contractor to chisel plow the compacted site. Impacts to tourism should be limited to Fort Belmont located in Jackson. However, the impacts should be minimal. No impacts to active sand and gravel mining operations will occur.

D. Effects on archaeological and historic resources

The proposed route will not impact any archaeological or historical resources.

E. Effects on the natural environment, including effects on air and water quality resources and flora and fauna

No significant impacts to air quality will result from the Project. The impacts to water quality resources will relate primarily to possible disturbances during construction. Transmission line poles will not be placed in wetlands, construction crews will avoid crossing wetland areas and where possible, wooden mats will be used to cross-wetlands and decrease compaction. During construction, there is the possibility of sediment reaching surface waters as the ground is disturbed by excavation, grading and construction traffic. Xcel Energy will implement practices during construction to prevent sediment from entering surface waters, such as silt fences. In addition, heavy equipment will not cross the Des Moines River or the East Fork of the Des Moines River. Once the Project is completed, it will have no impact on surface water quality. Flora and fauna within habitats along the Project corridor are typical of what will be found in an agricultural and urban setting. Since the Project will occur along roads, agricultural lands and urban areas that have been previously disturbed, no impacts are anticipated to native vegetation. The primary impact to fauna relates to the potential for avian collisions, particularly Canada geese. This risk will be minimized by the installation of swan flight diverters on the transmission line.

F. Effects on rare and unique natural resources

The USFWS and DNR did not identify any rare or unique natural resources that would be impacted by the Project. Xcel Energy identified a degraded prairie fragment along the proposed route. To mitigate any impacts that may occur, the DNR has requested that Xcel Energy revegetate disturbed soil adjacent to and within the prairie fragment with native prairie species. Xcel Energy will revegetate these areas with the approval of the landowner. Revegetating in this manner will improve the quality of the remnant while decreasing the opportunity for exotic species to invade the area.

G. Application of design options that maximize energy efficiencies, mitigate adverse environmental effects and could accommodate expansion of transmission capacity

The proposed route significantly mitigates environmental effects. By placing the line along I-90, impacts to farmers are minimized and a portion of the existing highway ROW can be utilized. By routing the line along the old railroad corridor by Jackson, visual impacts to Fort Belmont are minimized. By careful pole placement, the aesthetic impacts near the Des Moines River, Clear Lake and Fox Lake will be minimized. The proposed route also accommodates plans to add additional transmission capacity in the Project area. The proposed route was selected, in part, to accommodate a new 69 kV transmission line that is proposed to serve the community surrounding the City of Jackson. The first 10.9 miles of the line from Lakefield Junction Substation to Jackson will be constructed with poles that have double circuit capability so that 69 kV conductors can be installed on them in the future. Designing the route in this manner will minimize land use. Otherwise, the future 69 kV line would need to be built on a separate right-of-way. This double circuit design would also save approximately $1 million in costs associated with building the new 69 kV transmission line.

H. Use or paralleling of existing rights-of-way, survey lines, natural division lines and agricultural field boundaries

As discussed above, the proposed route will minimize land use by following I-90 and an old railroad right-of-way. Poles will be placed on section lines and field breaks where possible.

I. Use of existing large electric power generating plant site.

This factor is not applicable to the Project.

J. Use of existing transportation, pipeline and electrical transmission systems or rights-of-way

See sections C and G above.

K. Electrical system reliability

This Project has received a CON from the PUC and has been determined to support the further development of wind generation in the area.

L. Costs of constructing, operating and maintaining the facility which are dependent on design and route

This factor is not applicable to the Project because only one route is proposed. To the extent the factor is interpreted to concern rejected routes, Xcel Energy notes that the costs of constructing and maintaining the facility along the proposed route is likely equal to or less than along alternative routes. The proposed route will use existing ROW and parallel existing road ROW to the maximum extent possible, which will minimize land acquisition costs and environmental impacts.

M. Adverse human and natural environmental effects which cannot be avoided

The unavoidable impacts to human and natural environment are minimal. Construction related activities would cause short-term impacts, mainly in the form of disturbed soils. Long term, the installation of poles and conductors along the proposed route will create aesthetic impacts that cannot be avoided.

N. Irreversible and irretrievable commitments of resources

The proposed route does not require any irreversible or irretrievable commitment of resources. If the 161 kV line were removed in the future, the land could be restored to its prior condition and put to a different use.

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8.0 DEFINITIONS

Alluvium	Detrital deposits of modern rivers and streams.
Aquifer	An underground bed or layer of earth, gravel, or porous stone that yields water.
Archaic	A time frame in North American pre-history spanning 7,000 years between 10,000 before present to 3,000 years before present, after Paleoindian and before Woodland times.
Avian	Of or relating to birds.
A-weighted scale	The sensitivity range for human hearing
Calcareous	Containing calcium carbonate.
Conductor	A material or object that permits an electric current to flow easily.
Corona	The breakdown or ionization of air in a few centimeters or less immediately surrounding conductors.
Cretaceous	The third and latest period of the Mesozoic Era, occurring from 65 to 135 million years ago.
Crystalline	A general term for igneous and metamorphic rocks, as opposed to sedimentary.
End moraine	Moraine marking the terminal position of a glacier.
Fauna	The collective animals of any place or time that live in mutual association.
Flora	The collective plants of any place or time that live in mutual association.
Forb	A small, upright soft-stemmed or non-woody plant with broadleaves; the growth form of many common wildflowers.
Glacial meltwater channel	A channel resulting from the flow of melting glacial ice.
Glacial outwash	Drift deposited by meltwater streams beyond active glacial ice.
Glaciation	Involving glaciers and moving ice. Usually pertaining to processes associated with glaciers.
Granitic	Of, pertaining to, or composed of granite or granite-like rock.
Ground moraine	The material deposited from a glacier on the ground surface over which the glacier has moved.
Hydrocarbons	Compounds that contain carbon and hydrogen, found in fossil fuels.
Hypereutrophic	A very nutrient-rich lake characterized by frequent and severe nuisance algal blooms and low transparency.
Igneous	Rock formed by solidification from a molten or partially molten state.
Intermediate crystalline rock	An igneous rock containing between 52% and 66% silica (SiO_2).
Ionization	Removal of an electron from an atom or molecule.
Mafic crystalline rock	An igneous rock composed primarily of the magnesian rock-forming silicate minerals.
Mesic	Of sites or habitats characterized by intermediate moisture conditions, i.e. neither decidedly wet nor decidedly dry.
Metamorphic	A rock that has been formed in the solid state from changes in temperature, pressure or chemical environment.
Mississippian	A cultural period of the southeastern North American Aborigine Indians dating from 1,300 to 400 before present.
Moraine	Drift deposited by glaciers.
Oxide	A compound of oxygen with one other more positive element or radical.
Ozone	A form of oxygen in which the molecule is made of three atoms instead of the usual two.
Paleoindian	A cultural period of the North American Aborigine Indians defined as 40,000 to 12,000 years before present.

Passerine	Perching birds, mostly small and living near the ground with feet having four toes arranged to allow for gripping the perch; most are songbirds; hatchlings are helpless
pH	A unit for measuring hydrogen ion concentrations. A pH of 7 indicates a "neutral" water or solution. At pH lower than 7, a solution is acidic. At pH higher than 7, a solution is alkaline.
Physiographic	Geography that deals with the exterior physical features and changes of the earth
Precambrian	The first segment of geologic time, extending from the creation of Earth (4.5 billion years ago) to the appearance of the first animals (543 million years ago). The Precambrian represents about 88% of Earth's history.
Quartzite	A granulose metamorphic rock consisting primarily of quartz.
Quaternary	The most recent period of geologic time, extending from 1.8 million years ago to the present.
Raptor	A member of the order Falconiformes, which contains the diurnal birds of prey, such as the hawks, harriers, eagles and falcons.
Riparian	Pertaining to the banks of a body of water.
Scientific and Natural Area	A program administered by the DNR with the goal to preserve and perpetuate the ecological diversity of Minnesota's natural heritage, including landforms, fossil remains, plant and animal communities, rare and endangered species, or other biotic features and geological formations, for scientific study and public edification as components of a healthy environment.
Shale	A fissile rock that is formed by the consolidation of clay, mud, or silt, has a finely stratified or laminated structure, and is composed of minerals essentially unaltered since deposition
Stray Voltage	A natural phenomenon that can be found at low levels between two contact points in any animal confinement area where electricity is grounded. Electrical systems – including farm systems and utility distribution systems – must be grounded to the earth by code to ensure continuous safety and reliability. Inevitably, some current flows through the earth at each point where the electrical system is grounded and a small voltage develops. This voltage is called neutral-to-earth voltage (NEV). When a portion of this NEV is measured between two objects that may be simultaneously contacted by an animal, it is frequently called stray voltage. Stray voltage is not electrocution and is not DC, ground currents, EMFs or earth currents. It only refers to farm animals that are confined in areas of electrical use and not to humans.
Ultraviolet radiation	A portion of the electromagnetic spectrum with wavelengths shorter than visible light.
Understory	The layer formed by the crowns of smaller trees in a forest or the trees below the forest canopy.
Voltage	Electric potential or potential difference expressed in volts.
Waterfowl Production Area	Federally managed wetlands and surrounding uplands are open to hunting and wildlife watching. These lands are purchased and managed by the U.S. Fish and Wildlife Service to provide high quality wetlands and nesting cover for waterfowl and other species of wildlife.
Watershed	The area contained within a drainage divide.
Wetland	Wetlands are areas that are periodically or permanently inundated by surface or ground water and support vegetation adapted for life in saturated soil. Wetlands include swamps, marshes, bogs and similar areas.

Wildlife Management Area	Wetlands, uplands, or woods owned and managed for wildlife by the Department of Natural Resources (DNR). WMAs are managed for wildlife production and are open to the public for hunting and wildlife watching.
Wisconsinan glaciation	The most recent episode of glaciation in Minnesota that occurred from about 75,000 to 12,000 years ago.
Woodland	A cultural period of the Eastern North American Aborigine Indians dating from 3,000 - 1,300 before present.